Prevalence of Coccidia (Eimeria spp.) Infection in Domestic Rabbits, Oryctolagus cuniculus, in Riyadh, Saudi Arabia

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Abstract.- The prevalence of coccidia infection among domestic rabbits in Riyadh, Saudi Arabia was investigated for one year in the present study. Based on the morphological features of oocysts, ten species of Eimeria were identified in 100 fecal samples of domestic rabbits. The overall prevalence was 75%. Mixed infection with three different species occurred most frequently. The species detected and their prevalence values included the following: Eimeria coeckeliana (70%), E. magna (60%), E. perforans (60%) and E. media (55%) are mostly predominating and E. irresidua (30%) and E. flavescence (25%) were less common while E. intestinalis (7%), E. piriformis (6%), E. stiedai (5%) and E. exigua (5%) were relatively rare.

Keywords: Coccidia, rabbit, Eimeria, prevalence, Saudi Arabia

INTRODUCTION

In recent years, there has been increasing commercial production of rabbits as a source of protein. The consumers prefer rabbits for their low cholesterol and fat contents (Al-Mathal, 2008). In addition to this commercial value, these animals are used as very important models for medical research and as pets (Yousif and Abdul-Aziz, 1995). Therefore, rabbit production became one of the important animal resources in Saudi Arabia (Al-Mathal, 2008). Coccidiosis remains one of the most important infectious causes of digestive disorders in fattening rabbits (Vancraeynest et al., 2008). Coccidiosis is caused by intercellular protozoan parasites of the genus Eimeria and can causes significant mortality in domestic rabbits (Oncel et al., 2011). Although mortality can result from heavy infection by these parasites, the majority of infections result in morbidity due to lower weight gain and diarrhea (Renaux et al., 2003). Thus far, 15 species of Eimeria in rabbit have been identified (El-Shahawi et al., 2012). Of them, 14 are known to infect the intestine while one is located in the biliary ducts of the liver. The identification of these coccidia is based on the morphological characteristics of the oocysts, sporulation time, site of infection and clinical signs (Li and Ooi, 2009, El-Shahaw et al., 2012). Previously, three parasitological surveys have been conducted to identify different Eimeria species in domestic rabbits (Oryctolagus cuniculus) in Saudi Arabia. These studies are those of Kasim and Al-Shawa (1987) (identified seven species), Toula and Ramadan (1998) (identified five species) and Bashtar et al. (2003) (identified seven species). They reported in total of 10 species of Eimeria. To further understand the diversity of Eimeria spp. and epidemiological information of coccidiosis in Saudi Arabia, the present study was undertaken to determine the natural prevalence of Eimeria infections among domestic rabbits and to also describe the sporulated oocysts of the all species identified here in Riyadh.

MATERIALS AND METHODS

During the year 2011-2012, a total one hundred adult domestic rabbits (Oryctolagus cuniculus) were collected from Riyadh city in Saudi Arabia. These animals were caged separately. Fresh faecal samples were collected and examined microscopically for the incidence of the Eimeria infection. Fresh oocysts were collected from faeces of the infected rabbits and concentrated by flotation technique (Long et al., 1976). To determine the sporulation time, fresh collected non-
sporulated oocysts were suspended in 2.5% (W/V) aqueous potassium dichromate, placed in Petri-dishes in air and allowed to sporulate at room temperature (25±2°C). Periodic samples were examined under the microscope using an oil immersion objective lens and the progress of sporulation was recorded. The sporulation time was determined when sporozoites within the sporocysts were fully formed. The morphometric and the specific characteristics of unsporulated and sporulated oocysts were studied by Olympus microscope using the oil immersion lens. The length and width of at least fifty sporulated oocysts were measured. All measurements were made with an eyepiece micrometer and the oil immersion lens. The measurements were given in micrometre as means±SD followed by the range in parentheses. Only, oocysts with sharply defined outline and intact sporocysts were measured and recorded.

RESULTS

The present study revealed presence of oocysts of ten species of *Eimeria* in the faeces of rabbits in Riyadh, Saudi Arabia. The structural features of oocysts, their dimensions, and their presence or absence are used for the identification and differentiation of these species (Table I, Fig. 1). The eight species previously reported from Riyadh rabbits were present and two additional species (*E. exigua, E. piriformis*) were recorded for the first time in Riyadh city. Of 100 adult rabbits examined 75 (75%) were excreting oocysts of *Eimeria* species. Mixed infection with three species is most frequently occurring while infection with more than five species is rarely occurring. The overall prevalence for each species is shown in Table I. *Eimeria coecicola, E. magana, E. perforans* and *E. media* are mostly predominating and *E. irresidua* and *E. flavescence* were less common while *E. intestinalis, E. piriformis, E. stiedai* and *E. exigua* were relatively rare.

DISCUSSION

Coccidiosis is considered the major parasitic disease which causes severe economic losses in rabbit farming. Two forms of coccidiosis were recognized in rabbits; hepatic coccidiosis and intestinal coccidiosis. The hepatic coccidiosis is due to *E. stiedai* that cause severe damage to the liver and it is more pathogenic in young rabbits and led to death among these animals (Oncel et al., 2011). The intestinal coccidiosis can be classified into three types when clinical signs like weight gain, diarrhoea and mortality are taken into consideration (Lebas et al., 1986). These are non-pathogenic or slightly pathogenic species including *E. media, E. exigua, E. perforans* and *E. coecicola*, moderately pathogenic species including *E. irresidua, E. magna* and *E. piriformis* and very pathogenic species including *E. intestinalis* and *E. flavescens* (Jithendran, 1995). The identification of *Eimeria* species in rabbits has been performed using some biological features such as oocyst size and morphology (curvature, presence or absence of oocyst residuum, conspicuous/inconspicuous micropyle, sporulation time) (Coudert et al., 1995, Pakandl, 2009, Oliveira et al., 2011). Based on the previously mentioned criteria, ten *Eimeria* species were identified in the faeces of the rabbits collected from Riyadh city during the present study. Our descriptions of the sporulated oocysts of *Eimeria* from rabbits in the present study vary slightly in size and other characteristics with those from previous descriptions (Kasim and Al-Shawa, 1987, Toula and Ramadan, 1998, Razavi et al., 2010, El-Shahawi et al., 2012). Kasim and Al-Shawa (1987) and Bashtar et al. (2003) reported seven species from rabbits collected from central, eastern and western regions in Saudi Arabia while Toula and Ramadan (1998) recorded five species in Jeddah city in Saudi Arabia. In total ten species were reported so far in Saudi Arabia. The prevalence of coccidial infection in the domestic Saudi Arabian rabbits in previous studies has ranged from (73%) to (90%). In the present study, the prevalence of coccidial infection (75 %) was consistent with the previous study. The factors that might affect prevalence in domestic rabbits include management factors such as housing and the use of chemoprophylaxis (Chowdhury and Fraser, 2008). Mixed infection with three *Eimeria* species was most frequent in the present study and in all previous studies as natural infection with a single *Eimeria* species are rare (Mehlhorn, 2006, Khan et al., 2000). In conclusion commercial rabbits in
<table>
<thead>
<tr>
<th>Eimeria species</th>
<th>Prevalence (%)</th>
<th>Length (mm)</th>
<th>Width (mm)</th>
<th>Sporulation</th>
<th>Color</th>
<th>Gut Color</th>
<th>Shape</th>
<th>Pigment</th>
<th>Prevalence (%)</th>
<th>Length (mm)</th>
<th>Width (mm)</th>
<th>Sporulation</th>
<th>Color</th>
<th>Gut Color</th>
<th>Shape</th>
<th>Pigment</th>
</tr>
</thead>
<tbody>
<tr>
<td>E. stiedai</td>
<td>0.5</td>
<td>6.0</td>
<td>1.5</td>
<td>+</td>
<td>Yellow</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1.5</td>
<td>6.0</td>
<td>1.5</td>
<td>+</td>
<td>Yellow</td>
<td>-</td>
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<td>-</td>
</tr>
<tr>
<td>E. crandallii</td>
<td>10.0</td>
<td>8.0</td>
<td>2.0</td>
<td>+</td>
<td>Brown</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>20.0</td>
<td>9.0</td>
<td>2.0</td>
<td>+</td>
<td>Brown</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>E. cochielli</td>
<td>5.0</td>
<td>6.0</td>
<td>2.0</td>
<td>+</td>
<td>Brown</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>5.0</td>
<td>6.0</td>
<td>2.0</td>
<td>+</td>
<td>Brown</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>E. stiedai</td>
<td>0.5</td>
<td>6.0</td>
<td>1.5</td>
<td>+</td>
<td>Yellow</td>
<td>-</td>
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<td>1.5</td>
<td>6.0</td>
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</tbody>
</table>

**Table 1**: Characteristics of sporulated oocysts of *Eimeria* species from domestic rabbits. Measurements (in mm) are based on 30 oocysts of each species. Values are in mean (Range).
Saudi Arabia are under potential risk of coccidiosis and it is necessary to carry out further studies on epidemiology of coccidiosis in commercial rabbitries and to develop the appropriate control strategy against this disease.

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REFERENCES


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