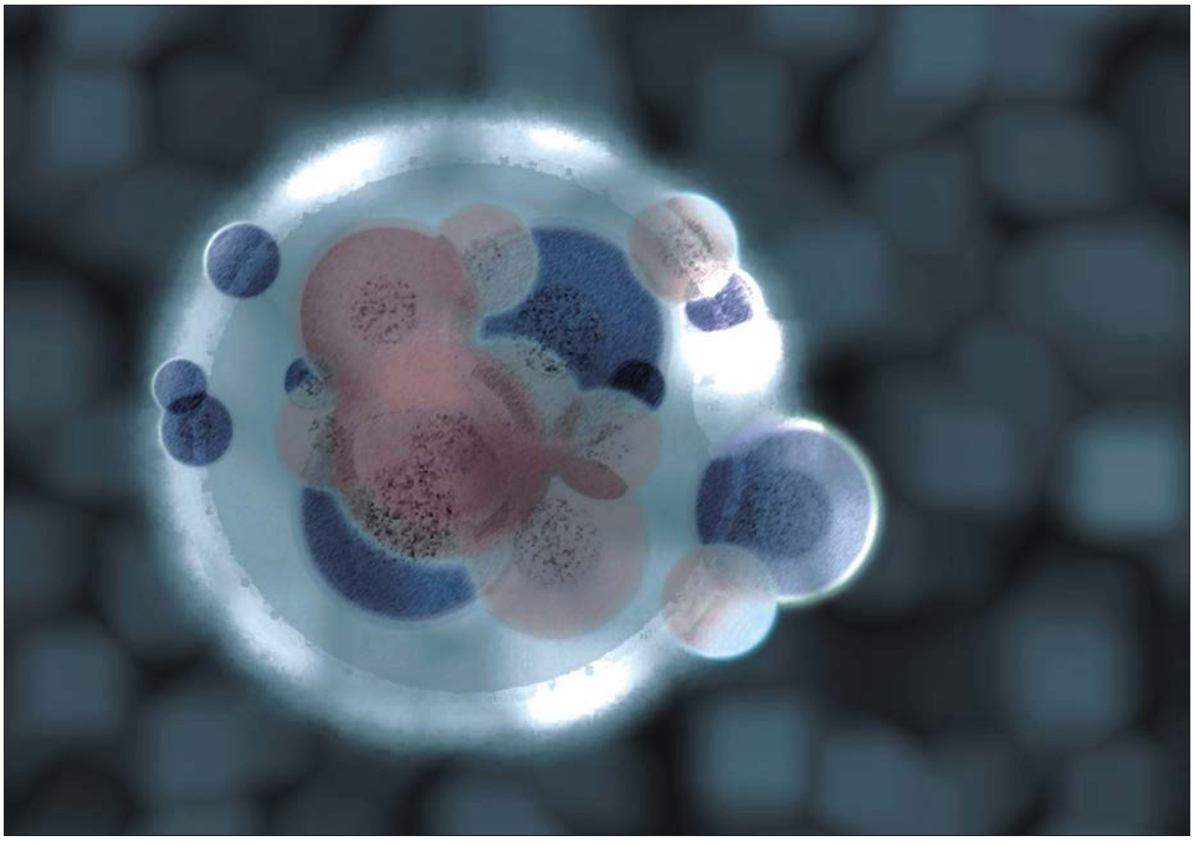

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Prevalence and Comparative Morphological Study of Four *Eimeria* sp. of Sheep in Jeddah Area, Saudi Arabia

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Abstract: A total number of 100 sheep (*Ovis aries*) from Jeddah were scanned for their intestinal coccidian infection. Four *Eimeria* sp. were detected in 41% of the examined sheep. The *Eimeria* species detected were *E. parva* (31.7%), *E. intricate* (26.8%), *E. arloingi* (22%) and *E. ovina* (17.1%). Mixed infection with two *Eimeria* species was most common (36.59%), followed by multiple infection with three species (34.15%). Multiple infections with four *Eimeria* species (17.07%) while a single species (12.20%) were less common.

Key words: Coccidia, *Eimeria* of sheep

INTRODUCTION

Coccidiosis is a worldwide distributed disease and one of the most economically important infections that threatening sheep industry. Coccidiosis occurs in all breeds and ages of sheep. Feedlot lambs aging 3 to 5 months have a high incidence, while older sheep carry the parasites and rarely develop the clinical signs of disease (Levine, 1973 and Pellerdy, 1974). Joyner *et al.* (1966) stated that sheep might harbor 11 species of *Eimeria*, e.g., *E. ovinoidalis*, *E. ovina*, *E. ahsata*, which were pathogenic species, *E. faurei*, *E. crandallis*, *E. parva*, *E. pallida*, *E. intricata*, *E. granulosa*, *E. gilruthi* and *E. punctata* were the nonpathogenic.

Moreover, Schrage (1968) observed *Eimeria* oocysts in 87% of 948 sheep in East Africa, while Mossalam (1972) found the incidence of ovine coccidiosis in Egypt to be 73% in ewes and 82% in lambs.

Jung Mann *et al.* (1973) stated that infestation of sheep with coccidia ranged from 46 to 93% while Glebezdin (1975) found that coccidial infestation ranged from 28 to 82% and concluded that coccidial infestation was common in the cropped zones than in desert or mountain zones in Turkmenistan. Furthermore, Majuro and Dipeolu (1981) found that 80% of trade sheep in Nigeria infected with coccidia. Kozakiewiez (1981) showed that ovine coccidiosis was established in 39% of state sheep in flocks and 31% in sheep of private farms.

A survey of the coccidia in domestic sheep and goats was conducted in Senegal where eight *Eimeria* species were detected in sheep: *E. ahsata*, *E. crandallis*, *E. faurei*, *E. intricata*, *E. ovina*, *E. ovinoidalis*, *E. pallida* and *E. parva* (Vercruysse, 1982). Morrsy (1983) recorded the incidence of ovine coccidia in Egypt to be 37%. Nine species of *Eimeria* were recorded: *E. arloingi* (30.21%), *E. ninakohlyakimovae* (17%), *E. parva* (15.10%), *E. crandallis* (14.83%), *E. ahsata* (12.91%), *E. granulosa* (2.47%), *E. intricata* (2.19%), *E. faurei* (1.64%) and *E. pallida* (0.54%). O'Callaghan *et al.* (1987) did a similar survey on sheep from four different locations in South Australia and identified eleven *Eimeria* sp. two more than those previously recorded by Morrsy (1983) which were *E. weybridgensis* and *E. ovina*.

Barutzki *et al.* (1990) studied the incidence of *Eimeria* sp. and seasonal dynamics in oocysts output from faecal samples of sheep from three different management systems in northwest Germany monthly over a 1 year period. They detected 10 species of *Eimeria* and observed that lambs passed larger numbers of oocysts in their faeces than either ewes or yearlings. The prevalence and identification of *Eimeria* sp. was also studied by Da Silva and Miller (1991) in the Louisiana State University ewe flock from 109 faecal samples. Unsporulated oocysts were recovered from 94 of the samples and 1208 oocysts representing 10 species of *Eimeria* were identified: *E. ahsata*, *E. crandallis*, *E. faurei*, *E. granulosa*, *E. intricata*, *E. ovina*, *E. ovinoidalis*, *E. pallida*, *E. parva* and *E. punctata*.

Amarante and Barbosa (1992) characterized the species of *Eimeria* affecting lambs and their infection pattern in Brazil. The species identified were *E. intricata*, *E. parva*, *E. pallida*, *E. crandallis*, *E. bakuensis*, *E. weybridgensis*, *E. ahsata* and *E. ovinoidalis*. On the other hand, Maingi and Munyua (1994) studied the prevalence and numbers of coccidian oocysts in faecal samples from young, immature and adult sheep in 15

farms in Kenya during the dry and wet seasons. Eight species of *Eimeria* were identified in these sheep. The prevalence of oocysts and OPG counts (oocysts per gram of faeces) were significantly higher in young sheep compared to immature and adult sheep during both seasons.

Arslan *et al.* (1999) examined 592 sheep of Turkey for coccidian infection. They found that 556 sheep (93.9%) were infected with different *Eimeria* sp. The prevalence of coccidiosis was significantly higher in young (97.9%) and immature sheep (96.6%) than in adult sheep (90.2%). Mixed infections were widespread (71.5%). Ten species of *Eimeria* were recognized which were *E. ovinoidalis* (47.7%), *E. bakuensis* (*E. ovina*) (46.6%), *E. parva* (37.1%), *E. granulosa* (27.7%), *E. ahsata* (23.4%), *E. pallida* (23.2%), *E. faurei* (15.1%), *E. intricata* (13.9%), *E. crandallis* (13.7%) and *E. punctata* (2.3%).

In Saudi Arabia, Mahmoud (1997) reported deaths of lambs due to *E. gilruthi* infection in Najdi lambs in Gassim region. Moreover, a study including examination of faecal samples from 593 sheep collected from five regions of Saudi Arabia was carried out by Kasim and Al-Shawa (1985) and showed that 86% of the examined sheep were positive. The following ten species of *Eimeria* were identified: *E. ovina*, *E. weybridgensis*, *E. parva*, *E. faurei*, *E. crandallis*, *E. ninakohlyakimovae*, *E. ahsata*, *E. granulosa*, *E. intricata* and *E. pallida*. The prevalence of infection was highest in the Eastern Region (93.3%) followed by the Western (90.6%), Southern (89.8%), Central (79.4%) and Northern Regions (77.5%), respectively.

MATERIALS AND METHODS

Fresh faecal samples from 100 sheep (*Ovis aries*) of varying ages and sexes were collected from different butcheries in Jeddah throughout one year.

Both sedimentation and floatation (using saturated salt solution) methods (Soulsby, 1982) were used to detect *Eimeria* oocysts. Suspensions of each faecal sample were strained through muslin cloth and examined using light microscopy.

For studying the sporulation time of the oocysts, positive samples were incubated under close observation in a shallow layer of 2.5% (w/v) aqueous potassium dichromate solution at room temperature (25-28°C). Morphological and morphometric criteria of the obtained sporulated oocysts were detected by oil immersion and measured by calibrated ocular micrometer. At least 10 sporulated oocysts from each sample were measured at a magnification of x1000. Oocysts were identified according to Hello and Hilali (1973), Pellerdy (1974) and Soulsby (1982).

RESULTS

Faecal samples collected from 100 sheep from different butcheries in Jeddah showed that 41 samples were positive for the presence of coccidial oocysts, an infestation percentage of (41%). Four different species of *Eimeria* were identified according to Morrsy as follows: *E. parva* (Kotlan *et al.*, 1929), *E. intricata* (Spiegl, 1925), *E. arloingi* (Marotel, 1905; Martin, 1909) and *E. ovina* (Levine and Ivens, 1970).

Mixed infections with two or three species were most common (15, 14). Multiple infection with four *Eimeria* was less common (7) and only (5) sheep were infected with a single species (Table 1). As to the prevalence of the four species of *Eimeria*, *E. parva* (31.7%) was the most common followed by *E. intricata* (26.8%), *E. arloingi* (22%) and *E. ovina* (17.1%) Table 2.

The diagnostic characteristics of the sporulated oocysts of the collected *Eimeria* were: *E. parva* (Kotlan *et al.*, 1929). The oocysts are spherical or sub-spherical 9.5-19×7.5-14.2 μm (mean 13.2×12.21 μm). The oocyst's wall is smooth with a uniform thickness, non-visible micropyle, no polar cap, pale yellow to yellowish green. The sporulation time takes from 2 to 4 days.

E. intricata (Spiegl, 1925). The oocysts are the largest among the species of *Eimeria* in sheep: 39-53 ×27-34 μm (mean 46×31 μm). The shape is ellipsoid and a micropyle 6 to 9 μm wide is present. The oocyst's wall is rough, brown in color and cross- striated. Sporocysts are ovoid, measure 16-18×8-10 μm and have a large residual body. Polar bodies are present. The sporulation time takes from 3 to 5 days.

E. arloingi (Marotel, 1905; Martin, 1909). The oocysts are ovoid and have a distinct micropyle and

Table 1: The number of *Eimeria* species in individual faecal samples of infected sheep

No. of *Eimeria* sp.	No. of infected sheep	Percentage
Infection with a single species	5	12.20
Infection with two species	15	36.58
Infection with three species	14	34.15
Infection with four species	7	17.07
Total	41	100.00

Table 2: Prevalence of different *Eimeria* species in infected sheep

Eimeria sp.	% of infection
E. parva	31.7
E. intricata	26.8
E. arloingi	22.0
E. ovina	17.1

micropyler cap. The oocyst's wall appears colorless to brown. The oocysts are 19-30×15-23 μm (mean 26.2 by 18.2 μm). The sporocysts are ovoid, they have a residual body and they measure 13×16 μm. A polar granule is present. The sporulation time takes from 2 to 3 days.

E. ovina (Levine and Lvens, 1970). The oocysts are ovoid and 23-36 microns×16-23 μm (mean 27×21 μm). The oocyst's wall is two layered with an outer layer, smooth and yellowish and the micropylar present is covered with a micropylar cap. The sporulation time takes from 2 to 4 days.

DISCUSSION

The present study shows that the coccidial infestation of sheep in Jeddah was 41% under the given conditions. This result agrees with that of Glebezdin (1975) who found that coccidial infestation in sheep in Turkmenistan ranged from 28 to 82% and concluded that coccidial infestation is common in the cropped zones than in desert or mountain areas. Kozakiewiez (1981) as well stated that ovine coccidiosis was established in 39% of state sheep in flocks, an incidence that is nearly similar to the present result.

The four identified *Eimeria* in the present study were also recorded from sheep in different countries such as Egypt (Mossalam, 1972; Morrsy, 1983), Nigeria (Majuro and Dipeolu, 1981), Senegal (Vercruysse, 1982), South Australia (O'Callaghan *et al*., 1987), Northwest Germany (Barutzki *et al*., 1990) and Brazi (Amarante and Barbosa, 1992).

Among the four detected *Eimeria*, *E. intricata* oocysts were the largest in size and with an ellipsoidal shape, while those of *E. arloingi* were the smallest in size and with ovoidal shape. On the other hand, *E. parva* was distinguished by its spherical shape and absence of polar cap. Oocysts of *E. ovina* were distinguished from those of *E. intricata* by having smooth, two-layered wall, while the oocyst's wall of *E. intricata* is rough and cross-striated. This differentiation with the other morphological and morphometric characteristics of the sporulated oocysts of the four species of the present identified *Eimeria* and their time of sporulation falls within the range given by previous authors (Hello and Hilali, 1973; Pellerdy, 1974; Soulsby, 1982).

In a previous survey on the species of coccidia occurring in sheep from different regions of Saudi Arabia, Kasim and Al-Shawa (1985) identified ten species of *Eimeria* in the western region of the Kingdom and showed that the percentage of coccidial infestation was 90.6% , while in the present study, only four species of *Eimeria* were identified from sheep in Jeddah (western region) and the percentage of infestation was only 41%. This difference may be due to various sanitation efforts in the management programs attempted by ovine producers to control coccidia or due to protective flock immunity, which often readily develops under field conditions.

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