

Camel coccidiosis caused by *Isospora orlovi* in the United Arab Emirates

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Abstract Between January and March 2001, a total of 22 dromedary calf carcasses from Dubai area were submitted for post-mortem examination. Eight of these calves (4 to 8 weeks old) came from 2 farms and showed diarrhoea between 2 and 5 days with no response to any treatment. Gross pathological examination of these calves revealed a severe diphtheroid to haemorrhagic colitis. Massive numbers of small coccidian-stages and some eosinophilic granulocytes were detected in the lamina propria by histopathological studies. It was considered that these stages belong to an *Isospora* spp., because typical oocysts containing 2 sporocysts with 4 sporozoites each were found in colon smears and faecal samples. Two *Isospora* spp. are described in camels: *I. orlovi* and *I. cameli*. However, *I. orlovi* is thought to be an avian form, accidentally ingested. The oocysts of our *Isospora* spp. seem to be very similar to *I. orlovi*. The observed colitis associated with a massive invasion of *Isospora*-organisms suggests that this species is much more pathogenic than reported in the literature.

Keyword: coccidiosis, diarrhoea, calves, camels.

Introduction

Six species of intestinal coccidian parasites have been described for old World camelids (Levine and Ivens, 1970. Levine, 1985). They are five species of *Eimeria* and one species of *Isospora* (*I. orlovi*). However, there may be other *Isospora* species e.g. *I. cameli* (Zigankoff, 1950. Kaufmann, 1996). There are numerous reports about coccidiosis in camels in the literature. However, severe coccidiosis causing enteritis and a mortality rate up to 10 % in young camels have only been reported in a few cases (Hamanchandran *et al.*, 1968. Gruvel and Grab ER, 1969. Chineme, 1980. Levine, 1985. Hussein *et al.*, 1987). On the other hand, many reports concerning the presence of coccidian oocysts are based on investigations of faecal samples of healthy camels. Gruvell and Graber (1969). found only 14 out of 204 faecal samples to be positive for coccidian oocysts. Mirza *et al.* (1976). diagnosed 86 % of faecal samples to be positive for *E. dromedarii* and *E. cameli* oocysts in Iraq. Dubey and Pande (1964). identified *E. rajasthanii*, *E. dromedarii* and *E. noelleri* oocysts in faecal samples from 45 healthy Indian camel

calves. Gill (1976) found oocysts of *E. cameli*, *E. dromedarii*, *E. pellerdyi* and *E. bactriani* in 24 % faecal samples from dromedaries in India. Y Agoub (1989) detected 17.4 % of a total of 230 faecal samples submitted from Sudanese camels to be positive for coccidian oocysts. All these reports regarding camel coccidiosis are dealing with *Eimeria* spp. However, there are only few reports of *Isospora*-infections in camels. Raisanghani *et al.* (1987) described one case in a six month old camel calf showing diarrhoea and abdominal pain. Faecal examination revealed 2000 *Isospora* oocysts per gram faeces. Size and shape of the oocysts were similar to *I. orlovi*. However, the authors did not identify the parasite. *I. orlovi* (Zigankoff, 1950) is thought by Pellerdy (1965) to be an avian form, accidentally ingested. The pathogenic role of the two *Isospora* spp., *I. orlovi* and *I. cameli* is unknown (Kaufmann, 1996).

Materials and Methods

Between January and March 2001, a total of 22 camel calf carcasses from Dubai area were submitted for post-mortem examination. Eight of these calves (4 to 8

week-old) came from 2 farms and showed diarrhoea between 2 and 5 days with no response to any treatment. All autopsies were performed within 1 to 5 hours after death. Pieces of intestine, liver, spleen and lymph nodes were taken for microbiological investigations using routine methods. The intestinal samples were also tested for the growth of anaerobes. For histopathological investigation, small pieces of all organs including compartment 1 and stomach, as well as muscles and body lymph nodes were taken. These samples were fixed for 24 hours in 10 % buffered Formalin. Five 5µm thin sections were cut and stained with haematoxylin and eosin.

Faecal samples from each camel calf were collected and tested with the flotation method. Direct smears were also prepared and examined. Twenty oocysts were measured under the microscope and average lengths and widths were calculated.

Results

Between January and March 2001, a new of camel calf disease occurred in the Dubai area. The calves on two farms showed diarrhoea between 2 and 5 days with no response to any treatment. No changes in feeding practice were observed. The mothers, which were kept in large pens, received hay ad libitum and small amounts of pellets. When the calves became sick, they were kept in smaller pens together with their mothers, which never showed any disease.

Gross pathological examination of eight calves from these 2 farms revealed severe diphtheroid to haemorrhagic colitis (Fig. 1). Massive numbers of small coccidian-stages were detected in the lamina propria of the colon by histopathological studies. Histological sections showed destruction and disorganisation of the mucosa together with haemorrhages and infiltration of inflammatory cells, mainly eosinophils and macrophages. Numerous coccidian stages

(zygotes and oocysts) were located in the mucosa of the colon (Fig. 2), but not in the small intestine. These oocysts, containing 2 sporocysts with 4 sporozoites each (Fig. 3) were also found in colon smears and faecal samples. Most of the oocysts were sporulated at the time of investigation.

The oocysts were ellipsoidal to ovoid, figure 8-shaped, 30-33 x 18-21µm with a smooth, 2-layer wall about 1µm thick; without a micropyle, polar granule, or residuum. The two sporocysts per oocyst were ellipsoidal with a size of 10-15 x 17-19µm containing four elongated ellipsoidal sporozoites 4-6 x 11-13µm in size. Microbiological investigations including anaerobic culture did not detect pathogenic bacteria.

Discussion

Severe coccidiosis causing enteritis and a mortality rate up to 10% in young camels have only been reported in a few cases (Hamanchadran *et al.*, 1968. Gruvel and Grab ER, 1969. Chineme, 1980; Levine, 1985; Hussein, 1989. Kinne and Wernery, 1997). The coccidian species associated with disease (coccidiosis) are primarily *E. cameli* and *E. dromedarii*, but also *E. rajasthani* seems to be pathogenic (Hussein *et al.*, 1987). All these species are belonging to the *Eimeria*-genus.

Between January and March 2001, a new camel calf disease occurred in the Dubai area. The calves on two farms showed diarrhoea between 2 and 5 days with no response to any treatment. Eight of these calves (4 to 8 weeks old) were submitted for post-mortem examination. Gross pathological examination of these eight calves revealed severe diphtheroid to haemorrhagic colitis. Massive numbers of small coccidian-stages were detected in the lamina propria by histopathological studies. *Eimeria* spp. are distinguished from *Isospora* spp. by the sporulated oocysts.

Eimeria spp. contain 4 sporocysts with 2 sporozoites each, whereas *Isospora* spp. have 2 sporocysts with 4 sporozoites each (Levine, 1985). It was considered that the coccidian stages in our cases belong to an *Isospora* spp., because typical oocysts (containing 2 sporocysts with 4 sporozoites each) were found in colon smears and faecal samples.

The oocysts of *I. orlovi* are described as ellipsoidal, ovoid, piriform, 'to figure 8-shaped, 27-35 x 15-20 flm with a smooth, 2-layer wall about 1 um thick without a micropyle, polar granule, or residuum. The sporocysts are ellipsoidal to ovoid (13-15 flm in diameter) with a residuum and without Stieda body. The sporozoites are elongated ellipsoidal, 7-10 x 4-6 flm (Levine, 1985; Pellerdy, 1965). As the oocysts in our cases resembled *I. orlovi*, it is believed that the outbreak was caused by *I. orlovi*.

It is worthwhile to note, that around 50 % of the oocysts were already sporulated in the faecal samples at time of investigation. In our laboratory it usually takes 6 to 24 hours to examine the slides after sampling. This might be long enough for oocysts sporulation. The high number of sporulated oocysts in the faeces may be a reason, that *I. orlovi* is thought by Pellerdy (1965). to be an avian form, accidentally ingested. As they are multiplying in the colon mucosa causing severe colitis (and no pathogenic bacteria were detected), our *Isospora* spp. is thought to be an original camel pathogen.

The source of infection remained unknown. The calves got only milk from their mothers and may have ingested also some hay. Since copper deficiency was diagnosed in dromedary calves and their dams in the UAE (Wernery *et al.* 2000) the calves may have tried to compensate a copper deficiency by ingesting sand containing *Isospora* oocysts. Treatment

with Baycox® in the recommended dosage was unsuccessful.

Figures



Fig. 1: Severe diphtheroid to haemorrhagic colitis caused by *Isospora orlovi*.

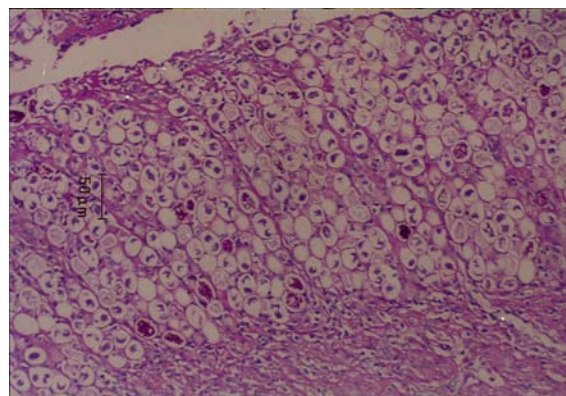


Fig. 2: Coccidian stages (zygotes and oocysts) were located in the mucosa of the colon

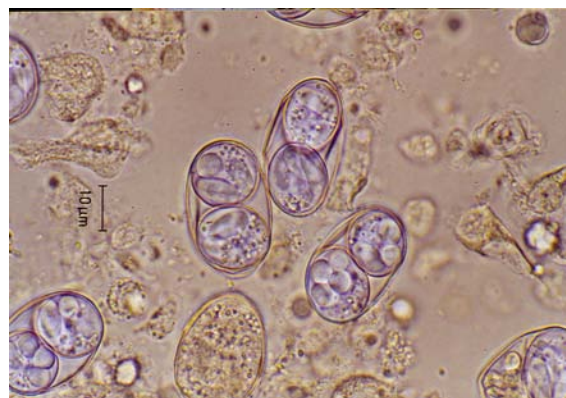


Fig. 3: Oocysts containing 2 sporocysts with 4 sporozoites each

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