

Diagnosis and Treatment of Coccidiosis in a Kangaroo

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Abstract

Kangaroo is a popular species at the zoo throughout the world. But the high incidence of diseases for captive kangaroos causes a lot of economy losses. There was a case of parasitic infestation in a zoo in Shandong Province, China. On March 21, 2019, a 6-year-old female kangaroo was having diarrhea. After intramuscular injection of penicillin for three consecutive days, the diarrhea disappeared. However, severe diarrhea occurred again, along with pus and bloody feces on March 25, 2019. Fecal samples were collected by enema, and parasitic eggs were seen under the microscope. Blood samples were collected, blood smears were prepared and examined, and electrolytes were analyzed. After intravenous injection of 5% glucose saline, oral levamisole and intramuscular injection of dexamethasone for three days, and the kangaroo condition improved and began to eat hay. Fecal smears under microscope indicated that the kangaroo was infected with coccidiosis. The coccidiosis is a widespread and economically significant disease, caused by protozoan parasites of the genus *Eimeria*, so some strategies should be taken to prevent the parasitic disease and reduce losses. Regular checking of feces for parasites and deworming must be carried out regularly.

Keywords: Kangaroo; Parasitic Disease; Coccidiosis; Diarrhea

Introduction

The kangaroo is a popular species at the zoos in the world. But it has a high incidence of diseases under captivity around the year. Wei Zhang (2020) reported 50 cases of various ailments in Kangaroo at Jinan zoo, Shandong, China, including digestive diseases (36%), respiratory diseases (22%), trauma (18%), lumpy jaw disease (16%), circulatory disease (6%), and urinary disease (2%) [1]. The highest incidence was reported in April and May [1]. It has been reported from Japan that the Eastern grey kangaroos (*Macropus giganteus*) frequently die younger than 19 months due to enteritis mostly during May to September [2]. A three-month-old male red-necked wallaby exhibited anorexia and diarrhea 10 d after introduction from Australia to the Republic of Korea and *Eimeria* oocysts were seen in feces and intestinal tissues [3]. Therefore, it is necessary to take efficient measures to prevent the coccidiosis in kangaroos at the zoos. Though diarrhea in kangaroos was described in published literatures in the past, diagnosis, treatment regimen and preventive measures of coccidiosis will be discussed in this case report.

Case Description

On March 21, 2019, a 6-year-old female kangaroo was found to have diarrheic symptoms in a zoo, Shandong Province, China. The veterinarian treated it with penicillin by intramuscular injection for three days, and the diarrhea disappeared. However, on March 25, 2019, severe diarrhea occurred again, with pus and bloody feces (Figure 1); On the afternoon of March 25, 2019, fecal samples were taken by enema, and a variety of coccidia were observed by microscope; On March 28, 2019, the kangaroo was transported to an animal hospital for diagnosis and treatment. After clinical veterinary consultation, blood samples were taken to prepare blood smears for observation, blood electrolyte analysis (Figure 2-5). The kangaroo was confirmed parasitic infection. The prescription was as follows (body weight: 20 kg): 5% glucose saline by intravenous injection; Levamisole, by oral taken, only once; Sumonol (amoxicillin clavulanate potassium) by intramuscular injection (1 mL), continuous injection for 5 days; Dexamethasone by intramuscular injection (2 mL), once. On March 29, 2019, the health of kangaroo was improved, with water-like feces. Then it began to eat a small amount of concentrate, but no hay. On March 31, 2019, the kangaroo has improved significantly and began to eat hay.



Figure 1: Macroscopic observation of purulent and bloody excrement of kangaroo at a zoo, Shandong, China.

On March 28, 2019, the feces of kangaroo were sampled by enema and analyzed by drug sensitivity test. There were five kinds of drug sensitive tablets: penicillin, erythromycin, piperacillin, ampicillin and ceftriaxone. On March 29, 2019, the results of drug sensitivity test were not obvious. On March 29, 2019, the blood smears of kangaroo were observed under the microscope. Figure 2 showed aged neutrophils having multiple lobes indicating inflammation of chronic stage. Figure 3 showed that the red blood cells were heteromorphic, that is to say, the red blood cells were of different sizes and shapes, round, oval and irregular, and nuclear relics appeared in many red blood cells. There were a large number of immature red blood cells in peripheral blood. There are some unknown things, maybe eosinophils, or bacteria, or parasitic infection in Figure 4. A lymphocyte was found in Figure 5.

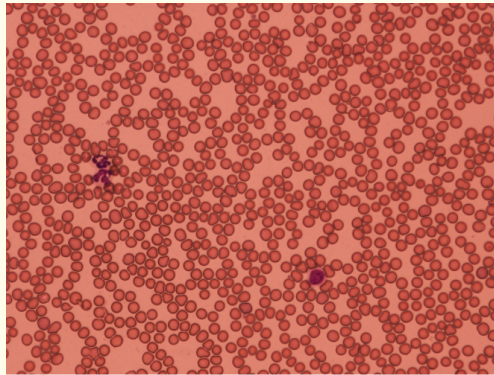


Figure 2: It shows the blood smear of kangaroo, and the neutrophil nucleus is divided into 4-5 lobes and large lymphocytes can be seen by Wright Giemsa staining. 100X.

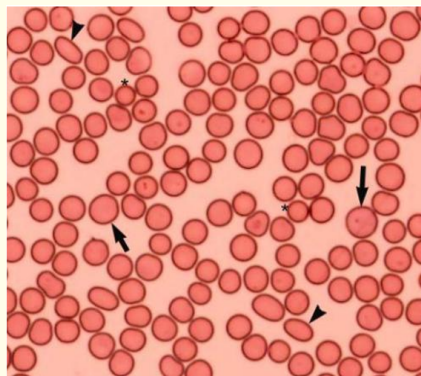


Figure 3: The blood smears of kangaroo were stained with Wright Giemsa. Arrow ↑ shows large red blood cells having nuclear remnants; The arrowhead ◄ shows elliptical red blood cells; The asterisk * indicates microcyte 400X.

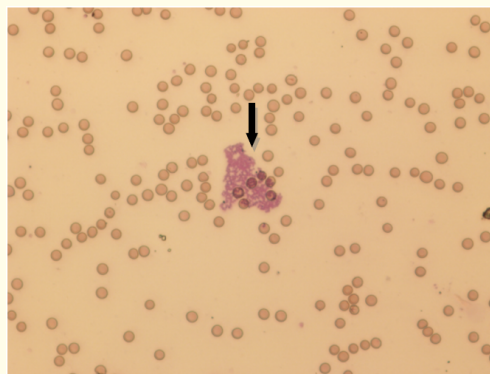


Figure 4: The blood smear of kangaroo. The arrow ↓ may be eosinophils, or bacteria, or parasitic infection 100X.

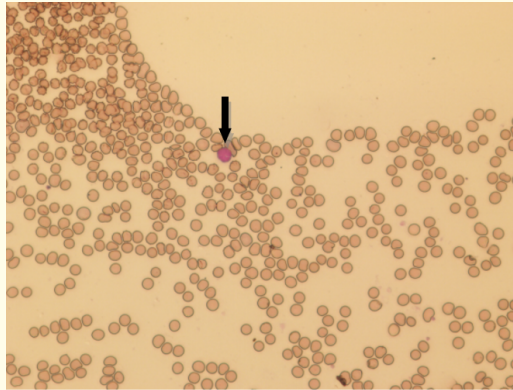


Figure 5: The blood smear of kangaroo. The arrow ↓ shows a lymphocyte 100X.

Discussion and Conclusion

The parasite in digestive tract for kangaroo is mainly *Coccidia* [1]. It is a globally distributed parasite with a wide host range, which causes serious harm to most livestock, poultry and wild animals, even catastrophic [4]. Coccidiosis is a widespread and economically significant disease, caused by protozoan parasites of the genus *Eimeria* [5]. In China, a lot of kangaroos were transported to the zoos to meet the needs of human, but the disease is a big threat nowadays.

Coccidiosis of kangaroo has been reported in China and abroad. In 1989, Barker, *et al.* first reported that kangaroos were infected with *Eimeria* [6]. After that, it was successively reported that coccidia oocysts and their schizonts were found in the smears of intestinal contents and intestinal histological examination of dead kangaroos [7-10]. Different species of kangaroos infected with coccidia are different and do not infect each other. Adult kangaroos are mostly insect carriers. Young kangaroos are infected by contacting feed, drinking water, bedding, soil or tools contaminated by adult kangaroo feces [11]. In 1996, the incidence rate of *Eimeria tenella* in the zoo was 61.3% (38/62), with a mortality of 39.2% (15/38), causing diarrhea, and severe drainage like frail stool and death within a few hours [12]. Mian Huang reported that secondary pneumonia was found in kangaroos infected with coccidia had secondary pneumonia, and the symptoms of digestive system were not obvious. The main manifestations were emaciation and shortness of breath. There was no coccidia infection in a mixed red necked kangaroo, indicating that coccidia had obvious host specificity [4]. In 2012, 10 kangaroos were sent to the zoo for the incidence of *Eimeria eharosi*, with an incidence rate of 100% (10/10) and a mortality rate of 10% (1/10). According to the pathological observation, the oocysts of *Eimeria eharosi* were mainly parasitic in the duodenum, and the most serious lesions were duodenal and jejunal mucosa (Figure 6-9) [13,14]. Adult kangaroos carry insects without clinical symptoms, but if there are stress factors such as feed, sudden change of feeding environment, long-distance transportation, increase of feeding density, improper feeding management and so on, it will lead to the outbreak of the disease. Acute cases are characterized by severe diarrhea and bloody stool, which are easy to cause extreme anemia, dehydration and weakness. Although actively treated, they have little effect and most of them turn to death. Therefore, when introducing kangaroos, it is necessary to appropriately extend the isolation time and repeatedly check their feces to ensure that there is no coccidia infection. At the same time, preventive medication can be used appropriately. If it is found in time, diagnosed early and treated in time, it can be controlled quickly and reduce economic losses [1]. Coccidia is mainly transmitted through fecal mouth. Because most disinfectants are not strong in killing parasite eggs, timely cleaning feces, flame disinfection trough, sink and ground can better cut off the transmission route. Kangaroo coccidiosis has caused great economic losses to the zoo, which should be paid attention to by veterinary workers [13].

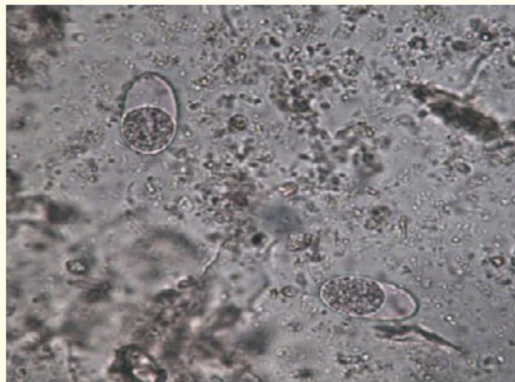


Figure 6: Unfertilized oocysts of coccidia in kangaroo (40X), a zoo in Jiangsu, China.

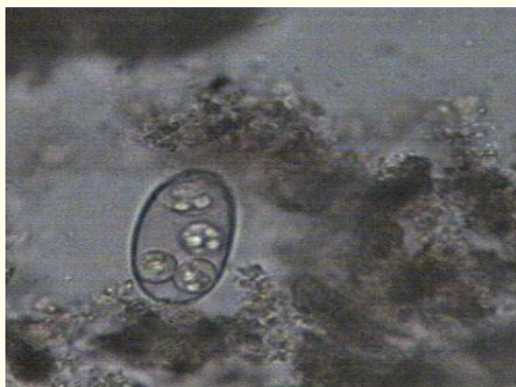


Figure 7: Sporulated oocysts of coccidia in kangaroo (40X), a zoo in Jiangsu, China.



Figure 8: Oocysts of coccidia 24h after incubation (40X).



Figure 9: Oocysts of coccidia 48h after incubation (40X).

From: Guodong Wang, Rong Chen, Jiaqiu Cheng, Mingjie Li, Nan Chen, Xiaoxia Zhang, Ling Jin. *Diagnosis and treatment of outbreak of Eimeria cogenensis in kangaroos*. 2013. *Chinese animal husbandry and veterinary Abstracts* 29(6):175,166.

Mian Huang (2008), Guodong Wang (2013), Chunzhong Xu (1998) had repeatedly reported cases of coccidia infection in different regions in China, which can cause diarrhea. In severe cases, it is like drainage, smelly and loose stool, and died a few hours later [4,12,13]. Parasitic infection is often easy to cause gastroenteritis, even bloody stool and purulent stool. It is very necessary to check parasites regularly. In daily work, we must strengthen feeding management and environmental sanitation, and disinfect regularly [12]. Some researchers reported the isolation of *Eimeria* spp. from a zoo specimen of red-necked wallaby (*Macropodidae*; *Macropus rufogriseus*) and determined partial gene sequences from the two isolates—the feces and intestinal contents after death, including segments of the 18S rRNA genes, and for the first time have used phylogenetic analyses of these sequences to assign the species to distinct clades [15]. Some new species of coccidian parasites were found in Australia by morphological and molecular phylogenetic analysis [16,17].

Catalyst items	Result	Reference range (Goat)	Reference result judgment
GLU	77 mg/dL	54-93	Normal
CREA	0.7 mg/dL	0.6-1.4	Normal
BUN	13 mg/dL	10-21	Normal
BUN/CREA	19	---	---
PHOS	4.2 mg/dL	4.2-7.6	Normal
CA	8.4 mg/dL	8.2-9.8	Normal
TP	6.1 g/dL	6.4-7.8	Low
ALB	2.6 g/dL	2.8-3.8	Low
GLOB	3.5 g/dL	---	---
ALB/GLOB	0.7	---	---
ALT	93 U/L	23-44	High
ALKP	434 U/L	75-228	High
GGT	69 U/L	60-101	Normal
TBTL	0.2 mg/dL	0.1-0.3	Normal
CHOL	71 mg/dL	63-108	Normal
AMYL	387 U/L	1-30	High
LIPA	164 U/L	---	---

Table 1: The blood electrolyte analysis of Kangaroo.

Note: As no reference values were available in the blood electrolyte analyzer, thus goat indexes were used as reference values.

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