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Outbreak of Balantidiosis Among Captive Chimpanzees (*Pan troglodytes*) at the Sanda Kyarimi Park, Maiduguri, Nigeria

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ABSTRACT

A clinical case of balantidiosis was investigated among a colony of four chimpanzees at the Sanda Kyarimi Park in Maiduguri, Nigeria. The chimpanzees were in apparently good health until the oldest female (aged about 26 years old) became weak, dehydrated and passed bloody diarrheoeic faeces. The clinical signs were milder in the other colony mates that showed only mild diarrhoea. Faecal examination was negative for metazoan parasites but revealed large numbers of the cysts and trophozoites of *Balantidium coli*. The cysts of *B. coli* were also recovered in large numbers from the soil samples within the primate cages and colony compound. The more severely affected female chimpanzee had lower packed cell volume, haemoglobin concentration and red blood cell values compared to the other colony mates. The parasites were introduced into the primate colony probably through new soil brought for flooring the compound or by the primate attendant or wild rodents within the zoo complex. Treatment with oral metronidazole was not rejected and cleared the parasites from the faeces 10 days post treatment. It is recommended that balantidiosis be considered in cases of enteritis in captive chimpanzees in Nigeria.

Key words: Balantidiosis, chimpanzees, Maiduguri, Nigeria

INTRODUCTION

Balantidiosis is an enteric disease caused by the protozoan parasite *Balantidium coli*. It occurs in many animal species, especially pigs, monkeys and the larger primates like chimpanzees, orangutang, gorilla and man (Flyn, 1973; Levine, 1973; Smyth, 1996). Infections are usually acquired through the ingestion of the cysts or trophozoites (Levine, 1973).

The parasite is considered to be of little clinical importance as a primary pathogen since it frequently occurs in association with other enteric pathogens (Kim *et al*., 1978). Although most primary infections due to *B. coli* are usually non clinical and self-limiting (Knight, 1978), the trophozoites are capable of tissue invasion and are a recognised cause of diarrhoea and dysentery in man and the larger primates (Levine, 1973; Teare and Loomis, 1982; Juniper, 1984; Smyth, 1996). More severe infections have been associated with perforation of the colon, hepatic abscesses, appendicitis, peritonitis and rarely death (Wenger, 1976; Zaman, 1978; Nicholson, 1978; Dorfman *et al*., 1984; Smyth, 1996).

There is no known documented case of balantidiosis in man or animals in Nigeria. This paper reports a clinical outbreak of balantidiosis caused by *B. coli* in a colony of captive chimpanzees (*Pan troglodytes*) maintained at the Sanda Kyarimi Park in Maiduguri, Nigeria.

MATERIALS AND METHODS

Historical background

The Sanda Kyarimi Park, Maiduguri has four chimpanzees (2 males and 2 females) in its collection. The animals had been acquired in 1980 from the near-by Gashaka Gumti Game Reserve in North-eastern Nigeria and have shared the same primate colony complex since then. They were in apparently good health until the oldest, a

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female aged 25 years became lethargic and frequently passed small amounts of light brown watery faeces that later became bloody. The animal consequently became dehydrated. The other chimpanzees in the colony were less affected and passed mainly light brown watery faeces..

Clinical examination

All the chimpanzees except the more severely affected female became very violent and had to be immobilized with Ketamine hydrochloride (Ketalar®, Park Davies). The vital parameters such as the rectal temperature, respiratory, heart and pulse rates and the capillary refill time were routinely determined and recorded. The weights of the animals were determined using a weighing balance.

Collection and examination of laboratory samples

Blood samples were routinely collected via the cephalic vein. Packed cell volume (PCV) was determined using the microhaematocrit method, red blood cell (RBC) and white blood cell (WBC) counts by the haemocytometer method, haemoglobin (Hb) concentration by Sahli's method while differential WBC count was determined by counting and differentiating 100 cells (Schalm *et al*., 1995).

Faecal samples were collected directly from the rectum. The samples were examined for parasites by both the direct faecal smear and the floatation techniques while counts of the occurring parasites were made by the modified McMaster technique using sodium chloride solution as the floating medium (MAFF, 1977). Counts of protozoan trophozoites were made per microscope field. Soil samples were collected from the primate cages and the colony compound and examined for parasites as described for the faecal samples. In all cases, occurring parasites were identified using standard parasitological criteria (Levine, 1973; Soulsby, 1982). Feacal examination was repeated two weeks following the treatment of the animals.

Treatment of animals

Following the clinical examination, collection and examination of laboratory samples, each of the chimpanzees was subsequently treated with Metronidazole (Flagyl®, May and Baker, Nigeria) at 400 mg orally, 3 times daily for 7 days.

RESULTS

The major clinical signs observed during the examination of the chimpanzees were lethargy, light brown coloured watery diarrhoeic faeces and anorexia. The signs were more pronounced in the oldest female that in addition showed severe bloody diarrhoea and dehydration.

Results of the faecal and soil examinations were negative for eggs and other stages of metazoan parasites. The results revealed that all the 4 (100%) chimpanzees in the colony had large numbers of *B. coli* trophozoites and cysts in their faeces (Table 1). The oldest and most severely affected chimpanzee had higher cyst and trophozoite counts, much lower PCV, Hb concentration and RBC counts than the other colony mates (Tables 1 and 2). *Balantidium* cysts but not the trophozoites were recovered in large numbers from the soil samples collected from the cages and the primate colony compound. Cysts occurred in larger numbers in the primate colony compound than the cages.

Table 1. Cyst and trophozoite counts recovered from chimpanzee faeces and soil from the primate colony complex

Source	Cyst counts/gram of sample	Trophozoite counts/gram of sample
Faecal samples (Chimpanzee)		
Male 1	300	100
Male 2	200	100
Female 1*	400	200
Female 2	100	75
All chimpanzees	250 ± 129 (100 - 400)**	119 ± 55 (75 - 200)
Soil samples		
Primate cages	265 ± 0.6 (100 - 400)	0
Colony compound	810 ± 1.1 (500 - 1200)	0

*Female with most severe disease; **mean ± SD (range)

Table 2. Haematological values of the captive chimpanzees examined at Maiduguri, Nigeria

Haematological parameters	Male 1	Male 2	Female 1*	Female 2	All animals (mean ± SD)	Range
Packed cell volume (%)	40.00	41.20	30.00	40.40	39.90 ± 5.30	30 - 41.20
Haemoglobin (g/dl)	11.00	19.00	10.00	12.90	13.20 ± 4.00	10 - 19.00
Red blood cells ($\times 10^6/\mu$l)	7.20	7.80	5.80	7.80	5.15 ± 0.90	5.8 - 7.80
White blood cells ($\times 10^6/\mu$l)	10.10	10.20	10.20	10.40	10.20 ± 0.10	10.1 - 10.40
Neutrophils ($\times 10^6/\mu$l)	6.65	67.20	6.53	7.28	680 ± 0.33	6.53 - 7.28
Monocytes ($\times 10^6/\mu$l)	0.03	0.26	0.05	0.28	0.16 ± 0.13	0.03 - 0.28
Lymphocytes ($\times 10^6/\mu$l)	3.27	3.05	3.50	2.70	3.13 ± 0.34	2.70 - 3.50
Eosinophils ($\times 10^6/\mu$l)	0.08	0.09	0.08	0.08	0.08 ± 0.01	0.08 - 0.09
Basophils ($\times 10^6/\mu$l)	0.06	0.08	0.04	0.06	0.07 ± 0.02	0.04 - 0.08

*Female with most severe disease

DISCUSSION

Balantidiosis is not usually considered a serious health problem for man and animals as most cases are either assymptomatic or mild and often self-limiting. However, in about 20% of the cases, a clinical syndrome identical to amoebic dysentery may be seen (Wenger, 1976; Teare and Loomis, 1982).

The results of the present investigation suggest that *B. coli* may be the primary pathogen involved in the outbreak. The large numbers of *Balantidium* cysts and/or trophozoites recovered from the faeces of the animals and soil in the primate compound and cages as well as the recovery of the animals following treatment for balantidiosis confirm this observation. However, the presence of a concurrent enteric viral or bacterial infection could not be ruled out. A similar outbreak of acute enteritis among a colony of lowland gorillas at the Los Angeles zoological gardens was also attributed to *B. coli* as the primary pathogen because no other enteric pathogen was noted and the large numbers of *Balantidium* cysts and trophozoites seen in the faeces were no longer present at or just prior to recovery (Teare and Loomis, 1982).

The oldest and most severely affected chimpanzee in this outbreak manifested more pronounced clinical signs, higher cyst and trophozoite counts and lower PCV, Hb and RBC counts than the rest of the colony mates probably due to the pathogenic effects of the parasite. The trophozoites of *B. coli* are capable of tissue invasion with varying forms of clinical manifestations depending on the organ involved (Zaman, 1978; Nicholson, 1978; Smyth, 1996).

The treatment of the chimpanzees with metronidazole was successful, as the parasites were not detected in the faeces by the 10th day post treatment. The findings were similar to those of Teare and Loomis (1982). In contrast however, there was no rejection of the oral medication, as the chimpanzees in the present outbreak did not refuse the dissolved drug in water. Consequently, unlike in previous reports (Teare and Loomis, 1982), there was no need for tranquillization and stomach intubation in the present treatment.

It was not immediately possible to determine the exact source of the infection to the chimpanzees. However, the animals had earlier (8 months previously) suffered an outbreak of mixed infection with *Entamoeba histolytica* and *Trichuris trichiura* during which *Balantidium coli* cysts and trophozoites were absent in both the faeces of the chimpanzees and soil samples from the colony compound (Mbaya and Nwosu, 2005). As part of the treatment and control effort then, a complete replacement of the flooring of the primate colony compound with new soil was effected. It is therefore possible that the cysts of *B. coli* might have been introduced into the colony with the new soil that might have gradually built up to pathogenic levels to initiate this outbreak. *Balantidium coli* cysts were recovered in large numbers from the soil samples in the primate compound and cages during this outbreak.

Furthermore, during the last amoebiasis outbreak (Mbaya and Nwosu, 2005), one of the attendants at the primate colony was also infected with *Entamoeba histolytica* and was replaced with a new staff. At the time of this outbreak, it was not possible to examine faecal samples from this attendant to confirm whether or not he was also infected with *B. coli* and thus constituted a probable source of the infection to the primates. Balantidiosis is a zoonotic disease with pigs and rodents being the major reservoirs of infection for man and other animals (Walzer *et al*., 1973; Zaman, 1978; Knight, 1978; Martio and Hale, 1986).). Transmission of infections from man to man or animal is also possible (Smyth, 1996). It is also likely that rats and other rodents that occur in large numbers in the zoo could have been the source of the pathogens to the chimpanzees in this outbreak.

The results of this study show that infections with *B. coli* may constitute a serious health problem to primates in zoological gardens. Consequently, the disease should be considered in the differential diagnosis of diarrhoea and dysentery for such animals in captivity. The results further show that balantiodiosis may constitute a serious public health problem as the parasites could be transmitted from the animals to zoo attendants or visitors and vice versa. Therefore there is need for public education regarding the control measures that could be adopted for the prevention of the infection.

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