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Preliminary Investigation of Zooanthroponosis in a Nigerian Zoological Garden

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Abstract: We investigated the 11 zookeepers at the University of Ibadan Zoological Garden, Ibadan, Nigeria for helminth ova and protozoan cysts and also conducted a sentinel study on the zoo animals. The faecal samples of 7 (63.6%) zookeepers were positive for either helminth ova or protozoan cysts. Helminths encountered were those of *Ancylostoma duodenale*, *Ascaris lumbricoides* and *Trichuris trichiura.* The cysts found included those of *Giardia Lamblia* and *Entamoeba histolytica*. Results of sentinel study on the zoo animals showed that faecal samples from the non-human primates contain ova and cysts of parasites that were found in the faecal samples from the zookeepers. This study affirms the possibility of transmission of parasitic infection from animals to man and vice versa in the Zoological Garden. Routine screening for parasites and anti-parasitic therapy for both zookeepers and animals are suggested.

Key words: Zooanthroponosis, helminth, protozoa, transmission, zoo, zookeepers

INTRODUCTION

Nearly most large cities in the world have Zoological Gardens, Wildlife Parks and Orphanages. Apart from being sites for relaxation and sources of generating funds from tourism, endangered species are also bred in captivity. These areas serve as places for educating the public about the principles of ecology.

It is however, interesting to know that most of the studies on zoological gardens have been directed towards the behaviour and welfare of the animals (Savage-Rumbaugh *et al*., 2007; Schapiro and Lambeth, 2007), while, relatively fewer studies have been conducted on the zookeepers; whose vital roles in ensuring proper rehabilitation and stability of the animals in an environment different from their normal habitat can not be overemphasised.

Although the role of the zookeepers offer significant benefits to maintenance of the zoo, the keepers also represent a potential public health risk, since they could play some role in the transmission of either known or emerging zoonotic infections from wild animals to the human community. Hence, a close watch on the health status of the zookeepers is necessary to ensure that they do not harbour diseases of zoonotic importance.

This study therefore, reports the result of a preliminary survey for protozoan cysts and helminth ova in the faeces of the zookeepers and the animals at the University of Ibadan Zoological Garden.

MATERIALS AND METHODS

Eleven zookeepers who have been in the Zoological Garden of University of Ibadan, Nigeria for 5 years and above were given universal bottles and their faeces contained in the bottles were collected the following day.

The faecal samples were taken to Parasitology laboratory where they were processed for helminth ova, protozoan cysts and trophozoites. All faecal samples were concentrated by brine floatation method (Thienpont *et al*., 1976; Urquhart *et al*., 2000). Cysts were identified by adding a drop of Lugol's iodine to a portion of the concentrated faecal sample on a microslide. The slides were examined for cysts under high and dry x 40 objective and the morphology of the cysts were identified according to Soulsby (1986). Wet mount preparations for protozoan trophozoites was also carried out (Soulsby, 1986), while, faecal samples positive for helminth ova were cultured for species identification using the method by Sellers and Dipeolu (1975) and Larvae from each culture were identified using the criteria described by Soulsby (1986).

Faecal samples from 20 animal species from the Zoo were also obtained with the help of the zookeepers and processed for identification of helminth ova and protozoan cysts with the same procedures described for the processing of the Zookeepers faecal samples.

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RESULTS

The faecal samples of 7 (63.6%) zookeepers were positive for either helminth ova or protozoan cysts (Table 1). Of these, 5 (45.5%) faecal samples were positive for *Ascaris lumbricoides*, *Ancylostoma duodenale* and *Trichuris trichiura*, while, *Entamoeba histolytica* and *Giardia* cysts were found in the faecal samples from 3 (27.3%) zookeepers. Both protozoan cyst and helminth ova were found in only 1 (9.1%) faecal sample. The samples from the remaining 4 (36.4%) zookeepers were negative.

The sentinel study carried out on the zoo animals showed that out of the 20 animal species (Jackal, Lion, Donkey, Hyena, Warthog, Putty moose, Gorilla, 7 types of monkeys, 3 types of Baboons, Gronnerant bird, Ostrich and Mangoose) examined for parasites, the non-human primates (Monkeys and Baboons) harbour more parasites than other animal species. High count of *Ascaris* ova was found only in the Mangaby Monkey, while *strongles*, *strongyloides* and *trichuris* ova were found in Monkeys and Baboons faecal samples. The Lion, Jackals, Warthogs had *Strongyles* ova in their faecal samples. *Strongles* and *strongyloides* ova were found in the samples from the donkeys. No parasites were found in the faecal samples from the Hyenas, Gorillas, Mongooses, Gronnerant Birds and the Ostriches (Table 2).

Table 1: Distribution of the helminth ova and protozoan cysts found in the faecal samples obtained from eleven zookeepers at the Zoological Gardens, University of Ibadan, Nigeria

Ascaris	*Strongyloides*	*Ancylostoma duodenale*	*Trichuris trichiura*	*Entamoeba* cyst	Giaridia cyst
-	-	+	+	-	-
-	+	-	-	-	-
-	-	-	++	-	-
-	-	+	-	-	-
-	+	-	-	++	-
-	-	-	-	-	-
-	-	-	-	-	-
-	+ +	-	+	+	-
+ +	-	-	-	-	-
-	+	-	-	+	+

(-): No worm egg/cyst, (+): 1-500 worm eggs per gram of faeces, (++): 500-5000 worm eggs per gram of faeces

Table 2: Distribution of the helminth ova found in the faecal samples obtained from animal species at the Zoological Gardens, University of Ibadan, Nigeria

Species	*Ascaris*	Strongles	*Strongyloides*	*Trichuris*
Jackal	-	+++	-	-
Lion	-	+++	-	-
Donkey	-	++	++	-
Hyena	-	-	-	-
Wart hog	-	++	++	-
Puty mose	-	-	+	+
Gorilla	-	-	-	-
Mona monkey	-	++	+++	++
Drill monkey	-	-	-	+
Patas monkey papino	-	+	-	++
Younger patas monkey	-	-	+++	++
Mangaby monkey	+++	-	-	-
Green monkey	-	-	+++	-
Deico monkey	-	++	-	-
Baboon dona	-	-	++	-
Baboon major	-	-	-	++
Baboon maramal	-	-	-	++
Gronnerant bird	-	-	-	-
Ostrich	-	-	-	-
Mongoose	-	-	-	-

(-): No worm egg/cyst, (+): 1-500 worm eggs per gram of faeces, (++): 500-5000 worm eggs per gram of faeces, (+++): >5000 worm eggs per gram of faeces

DISCUSSION

The difference between the infected and uninfected zookeepers could be due to varying level of hygienic practices of individuals.

The detection of *Ascaris lumbricoides*, *Ancylostoma duodenale* and *Trichuris trichiura*, in the faeces of the keeper is consistent with previous study (Onadeko and Ladipo, 1989), which reported Ascariasis and Ancylostomiasis as the most common helminthic infections in South-Western Nigeria where the zoo used in the study is located.

The transmission of parasitic infection from man to animals has not been well documented in this part of the world; however, more attention should be given to the possibility of reverse zoonosis, particularly in area of consistent contact between animals and man and places with very low hygienic practices.

Previous studies conducted in University of Ibadan zoological garden (Enyenihi, 1972) and a public Zoological Garden in Ibadan (Dipeolu, 1975), suggested that man was the source of constant re-infection of *E. histolytica*, *A. duodenale* and *Strongyloides stercoralis* to monkeys. It is also interesting to know that some parasites of man (*Trichuris trichiura*, *Ancylostoma duodenale*, *Ternidens deminutus* and *physaloptera cancasica*), were found in the intestine of a baboon shot at the Borgu sector of the Kainji Lake National Park (Crockett and Dipeolu, 1984). The baboon was suspected to have acquired the infection possibly from the faeces of the scouts in the park.

Baboons (*Papio cynocephalus anubis*) with naturally acquired *Trichuris trichiura* infection has also been reported (Reichard *et al*., 2007). The transmission of *Giardia* sp. from humans to beavers, dogs and muskrats suggests that it is zoonotic and similar gene sequences among isolates support this possibility (Fayer *et al*., 2004). It is also not clear whether, *Giardia* sp. or *Entamoeba histolytica* is strictly host-specific or not (Asano *et al*., 1991; Stanley, 2003); perhaps they could have non-human primate hosts.

This study showed that samples from non-human primates (monkeys and baboons) contain higher level of helminth ova than other animal species. The presence of *Ascaris lumbricoides* and *Trichuris trichiura ova affirms* the possibility of transmission of parasites from human to the animal and vice versa, Since, the frequency of direct contacts between humans (Zookeepers and visitors) and the non-human primates is higher than with other animals that are less approachable. This supports the suggestion that in communities of closely related species, cross-species interaction may be an important source of infection risk (Ezenwa, 2003). Zoonotic, epizootic and/anthroponotic transmission may occur and be promoted by various interactions in a setting like the Zoo.

This study along with other previous studies emphasises the need to pay a closer attention to the health of zoo animals and their handlers so as to mitigate disease transmission and further elucidate the role of zookeepers and animal handlers in disease transmission; since they are responsible for providing feed and water for the animals and for cleaning of the environment.

CONCLUSION

This study suggests the need for future studies to determine the risk and mechanism of cross-transmission of parasites of public health importance in zoological gardens. Furthermore, constant surveillance, improved hygienic practices and a well adjusted anthelmintic programme for both the zoo workers and the animals will reduce risk of cross infection.

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REFERENCES

Asano, R., S. Hokari, E. Murasugi, Y. Arashima, N. Kubo and K. Kawano, 1991. Studies on the giardiasis as the zoonosis. II. Giardiasis in dogs and cats. J. Japanese Assoc. Infect. Dis., 65 (2): 157-161. PMID: 2066596.

Crockett, E.C. and O.O. Dipeolu, 1984. A survey of helminth Parasites of game animals in Kainji Lake National Park of Nigeria. Int. J. Zoonoses., 11 (2): 204-215. PMID: 6534907.

Dipeolu, O.O., 1975. Public health aspects of parasitic infection of Zoo: Agodi gardens experience. Vet. Surg., 4: 40-43.

Enyenihi, U.K., 1972. Parasitic infections of animals in the University of Ibadan zoo. Afr. J. Med. Med. Sci., 3 (4): 283-294. PMID: 4628790. www.ncbi.nlm.nih.gov/pubmed/4628790.

Ezenwa, V.O., 2003. Habitat overlap and gastrointestinal parasitism in sympatric African bovids. Parasitology, 126: 379-388. DOI: 10.1017/S0031182002002913. PMID: 12741517. http://journals.cambridge.org/action/displayAbstract;jsessionid=F8EB4094AA139B182BF601F238F0EF5D.tomcat1?fromPage=online&aid=148193.

Fayer, R., J.P. Dubey and D.S. Lindsay, 2004. Zoonotic protozoa: From land to sea. Trends Parasitol., 20 (11): 531-536. DOI: 10.1016/j.pt.2004.08.008. PMID: 15471705. www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6W7G-4D7JY83-1&_user=6116012&_rdoc=1&_fmt=&_orig=search&_sort=d&view=c&_acct=C000069358&_version=1&_urlVersion=0&_userid=6116012&md5=027fd129935cbf64e056bf7c5bfb6925.

Onadeko, M.O. and O.A. Ladipo, 1989. Intestinal parasitic infestation in rural communities: A focus for primary health care in Nigeria. Afr. J. Med. Med. Sci., 18 (4): 289-94. PMID: 2558560. http://www.ncbi.nlm.nih.gov/pubmed/2558560.

Reichard, M.V., R.F. Wolf, D.W. Carey, J.J. Garrett and H.A. Briscoe, 2007. Efficacy of fenbendazole and milbemycin oxime for treating baboons (*Papio cynocephalus anubis*) infected with *Trichuris trichiura*. J. Am. Assoc. Lab. Anim. Sci., 46 (2): 42-45. PMID: 17343352. www.ingenta-connect.com/content/aalas/jaalas/2007/00000046/00000002/art00007.

Savage-Rumbaugh, S., K. Wamba, P. Wamba, N. Wamba, 2007. Welfare of apes in captive environments: Comments on and by, a specific group of apes. J. Appl. Anim. Welf. Sci., 10 (1): 7-19. DOI: 10.1080/10888700701277261. PMID: 17484674. http://www.informaworld.com/smpp/content~content=a788000924~db=all~order=page.

Schapiro, S.J. and S.P. Lambeth, 2007. Control, choice and assessments of the value of behavioral management to nonhuman primates in captivity. J. Appl. Anim. Welf. Sci., 10 (1): 39-47. DOI: 10.1080/1088870-0701277345. PMID: 17484677. http://www.ncbi.nlm.nih.gov/pubmed/17484677.

Sellers, K.C. and O.O. Dipeolu, 1975. Technical Note: A simple Baerman Technique for the culture of third stage *Hyostrongylus rubidus* and *Oesophagostomum* sp. larve. J. Nig. Vet. Med. Assoc., 4: 97-100.

Soulsby, E.J.L., 1986. Helminths, Arthropods and Protozoa of Domesticated Animals. The English Language Book Society, Bailliere Tundall, London, pp: 142-318.

Stanley, S.L. Jr., 2003. Amoebiasis. Lancet, 361 (9362): 1025-1034. DOI: 10.1016/S0140-6736(03) 12830-9. PMID: 12660071. http://www.ncbi.nlm.nih.gov/pubmed/12660071.

Thienpont, D., F. Rochete and O.F.J. Vamparijs, 1976. Diagnosing helminthiasis through corprological examination. Janssen Research Foundation Beerse Belgium, pp: 47-183.

Urquhart, G., J. Armour, J.L. Duncan, A.M. Dunn and F.W. Jennings, 2000. Veterinary Parasitology. Longman Scientific Technical, U.K., pp: 4-96.