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Shotuyo A.L.A ● Oduntan O.O ● Obuotor T.M ●  
Akintunde O.A ● Coker A.T.



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Maiduguri, Nigeria

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## SURVEY OF ZONOSSES IN CAPTIVE ANIMALS IN FEDERAL UNIVERSITY OF AGRICULTURE, ABEOKUTA (FUNNAB) ZOO PARK

SHOTUYO A. L. A.<sup>a\*</sup> • ODUNTAN O. O.<sup>a</sup> • OBUOTOR T.M.<sup>b</sup> • AKINTUNDE O. A.<sup>a</sup>  
• COKER A. T.<sup>a</sup>

<sup>a</sup> Department of Forestry and Wildlife Management, Federal University of Agriculture,  
Abeokuta, P.M.B. 2240, Abeokuta, Ogun State.

<sup>b</sup> Department of Microbiology, Federal University of Agriculture, Abeokuta, P.M.B. 2240,  
Abeokuta, Ogun State.

Corresponding Author's e-mail: [shotuyoala@funaab.edu.ng](mailto:shotuyoala@funaab.edu.ng) (08033455902)

**ABSTRACT:** The study investigated the prevalence of zoonoses among captured wild animals in FUNAAB Zoo Park. Freshly voided faeces were collected from the animals at the zoos between October and November, 2017 with assistance of the animal handlers. Faeces collected were stored in well labelled 30 ml sample bottles and kept in cool box- transport medium containing ice packs to the laboratory for preservation and analysis at the laboratory. Microbial identification returned negative for all avian species, while from the carnivores, 500 eggs per gram of *Ancylostoma sp* were isolated in faecal samples obtained from the civet cat and none from the Jackal. Microbial identification of faecal samples from the primates showed 300 eggs per gram of *Trichuris sp* for Mona Monkey, 100 eggs per gram of *Strongyloides fulleborni* for the patas monkey, 400 eggs per gram of *Trichuris sp* for the Anubis baboon and 100 eggs per gram of *Oesophagotomum sp* for the putty nose monkey. Faecal samples obtained from the vevet monkey had no micro-organism isolated. From the reptiles, 3000 eggs per grams of *Oxyurioid sp* were isolated from faecal samples of the giant tortoise, and 2400 eggs per grams of the same microbial species was isolated from faecal samples obtained from the regular tortoise. No microbes were isolated from faecal samples from rodents, and ungulates. The results found out that the microbes identified were host specific and reptiles were the mostly affected animals followed by carnivores and primates.

**Keywords:** Captive Animals, Survey, Zoonosis, Zoo park

### 1. INTRODUCTION

A zoological garden commonly referred as zoo is an institution where wild animals are kept for public display only rather than circus purposes (Clubb and Mason, 2002). It allows for interactions with animals and provides numerous benefits to children and adults through education and entertainment, hence zoos and biological parks are considered as a centre point for public recreation and education (Chethan *et al.* 2013). Apart from this, many health benefits of human–animal interaction have been documented and include reduced anxiety and lowered blood pressure (Dunn *et al.*,

2015). Contact with farm animals occurs in a variety of settings, such as visits, animal exhibition, petting zoos, and rodeos (Pickering *et al.*, 2008). Such events can be “wildlife/animal-tourism” activities offered in zoos for entertainment or educational purposes.

Wildlife-tourism has benefits for both farmers and the public, including educating the public about different wildlife species, developing interaction between visitors and zookeepers, improving relationships between humans and animals. Despite the many benefits of such public display events, there are also significant risks if proper hygiene measures are not

taken. Of particular importance are zoonotic diseases (or zoonoses), which are infections transmitted between animals and humans (Kruse *et al.*, 2004).

Infants and children are at the greatest risk of acquiring zoonotic pathogens from wildlife animals (Dunn *et al.*, 2015). This is often a consequence of poor hygienic practices, attraction to or curiosity about animals, and an immature or inadequate immune system (Pickering *et al.*, 2008; Dunn *et al.*, 2015). In many cases, the zoonotic illnesses are preventable through improved hygiene (Erdozain *et al.*, 2015). The symptoms and consequences of these infections also tend to be more severe in infants and young children (Pickering *et al.*, 2008). People of any age with primary or secondary immunodeficiency are at risk of more severe disease, especially pregnant women and the elderly (Pickering *et al.*, 2008). Most frequently, zoonotic infections are of the gastrointestinal tract, with mild to severe outcomes ranging from diarrhea, abdominal cramping, and vomiting to bloody diarrhea, kidney failure, and, in some cases, death (Dunn *et al.*, 2015). Although such reports come from zoos where poor hygiene and sanitation practices exist, which is further worsened in some cases where infected animals remain asymptomatic but continue to shed pathogens in their faeces, urine and saliva. Such secretions and excretions contaminate nearby enclosures, thus spreading the disease to other susceptible animals, veterinarians, zoo staffs and visitors of the zoo (CDC, 2007).

The prevalence of zoonotic enteric organisms in zoo animals and their potential risk can be estimated from gastroenteritis in visitors after handling animals in petting zoos (Crump *et al.*, 2003; Chertow, 2006) and sometimes, inhalation of dust, aerosol and droplet nuclei generated from diseased animals is another important route for zoonotic diseases such as tuberculosis, chlamydiosis and influenza. Some of these infectious agents may be passed in animal feces and transmitted to humans through fecal-oral contact, while some are vector based. Quantifying them and understanding their mode of transmission might help with creating an effective strategy against the outbreak of zoonoses and transmission (Chertow, 2006).

The fact that parasites can have a significant impact on the population dynamics of wildlife has emerged as a critical issue in the conservation of threatened species

(Burthe *et al.*, 2008). Captured wild animals can serve as vectors for disease (Greger, 2007). Wildlife plays important roles as sources, reservoirs, and amplifiers of emerging human and livestock pathogens (Greger, 2007). Diseases in wild animals pose not just health risks but enormous economic impacts with emotional and health risks involved. The study seeks to investigate the prevalence of zoonoses among captured wild animals in Funaab Zoo Park.

## 2. METHODOLOGY

### 2.1. Study area

The study was carried out in FUNAAB Zoo Park (FZP), located along (latitude 7° 13' 15" N; longitude 3° 26' 51" E) Abeokuta. The FUNAAB Zoo Park (FZP) was commissioned on the 23rd May 2012 (Figure 1).

The site has a gentle undulating landscape and mild slope. The zone has a fair terrain of not more than 300 metres above sea level. The area has an annual rainfall of 1200mm with its peak in June and July. The relative humidity of the area is 82.54% and an average monthly temperature of 35.8°C. The population in Abeokuta is 374,843 of which 183,281 are males and 191,586 are females (the National Population Commission 1992, a publication of the NPC. Abuja Census News 1992).

### 2.2. Data Collection and Analysis

#### 2.2.1. Sample collection and preservation

Freshly voided faeces were collected from the animals at the zoos between October and November, 2017 with assistance of the animal handlers. The topmost part of the faeces was scooped to prevent contamination. A clean black nylon was spread under free standing bird cages to collect faeces on dropping. About 20-30 g was collected in interlocked polythene bags. The samples were properly sealed, labelled with date, time, and location and transported to the laboratory with ice-cold condition to avoid hatching of eggs and immediately transferred to containers containing 10% formalin as the preservative. Faeces collected were stored in well labelled 30 ml sample bottles and kept in cool box-transport medium containing ice packs to the laboratory for preservation and analysis at the laboratory.



Figure 1: Map of the Federal University of Agriculture, Abeokuta Zoo park

#### 2.2.2. Qualitative examination of faecal samples

Faeces from free ranging wild animals were grossly examined for species-specific consistency, colour and presence of proglottids and adult worms. Direct microscopic examination (quick method) were carried by placing a very small quantity of faecal droppings on a glass slide using a tooth pick and emulsify with a drop of water and place a cover slip to view on the microscope (Suwansakri *et al.*, 2002).

#### 2.2.3. Centrifugal sedimentation method

Centrifugal sedimentation and/or floatation technique to determine trematode eggs, cestode eggs, nematode eggs and coccidian oocysts were followed for qualitative analysis of faeces with few modifications according to the method described by Ugbomoiko *et al.*, (2008).

Screening for eggs of trematodes and cestodes will be followed. Small quantities of faeces (3 gm) were mixed with water (15 ml) and then filtered using a strainer to remove coarse faecal material. The filtrate was poured into a centrifuge tube and centrifuged at 2000 rpm for 5 minutes. A drop of the sediment was collected on a clean, dry glass slide, placed a cover glass and examined under low power (10X) of the microscope.

Presence of helminth ova were recorded and expressed as a percentage of samples screened for species and amongst orders. Parasite richness count for primate species was deduced by counting the number of nematode helminths discovered in the different species (Gillespie, 2006).

#### 2.2.4. Floatation method

Screening for eggs of nematodes follows after centrifugation method. A small quantity of faeces (3 gm) will be mixed well with water (15 ml) and emulsion was strained through a nylon tea strainer to remove coarse faecal material. The filtrate was poured into a centrifuge tube and centrifuged at 2000 rpm for 5 minutes. The supernatant was discarded and the tube was again refilled with water and centrifuged 2 – 3 occasion until the supernatant was cleared. The sediment was then mixed with a saturated sugar solution (10 ml) in a centrifuge tube and again centrifuged. A drop of the fluid was placed on a clean, dry glass slide from the top layer of fluid and examined under low power (10X) of the microscope.

#### 2.2.5. Stoll's dilution technique

About 3 grams of faeces from thoroughly crushed and mixed whole faecal pellets was taken in a stoppered graduated flask to which N/10 NaOH solution was added up to 45 ml mark. After adding 10-12 glass

beads, the flask was tightly closed and shaken gently to mix the contents. After shaking, 0.15 ml of the well mixed suspension was drawn with a pipette and placed on a glass slide, covered with a cover slip and the total number of eggs in the entire preparation was counted under low power objective (10X) of the microscope. The number of eggs per gram of faeces was determined by using the formula:

EPG = Number of eggs x 100 (where 100 is the dilution factor).

The prevalence of gastro-intestinal parasites in captive wild animals was recorded with respect to captive wild carnivores, herbivores and primates.

### 2.3. Statistical analysis

All data obtained were analysed using descriptive statistics of the IBM SPSS Statistics 20 Analytical software.

## 3. RESULTS

### 3.1. Microbial Egg Counts in Faecal Samples of Aves

The result of the microbial determination of faecal samples from avians is shown in Table 1. Faecal samples from all birds in the Zoo Park had no microbial egg counts. Microbial identification returned negative for all avian species.

### 3.2. Microbial Egg Counts in Faecal Samples of Carnivores

The result of the microbial determination of faecal samples from carnivores Park is shown in Table 2. The results showed that 500 eggs per gram of *Ancylostoma sp* were isolated in faecal samples obtained from the civet cat, while no microbial organism was isolated from faecal samples obtained from the Jackal.

### 3.3. Microbial Egg Counts in Faecal Samples of Primates

The result of the microbial determination of faecal samples from primates is shown in Table 3. The results showed that 300 eggs per gram of *Trichuris sp* were isolated in faecal samples obtained from the Mona Monkey, 100 eggs per gram of *Strongyloides fulleborni* were identified in faecal samples obtained from the patas monkey, while 400 eggs per gram of *Trichuris sp* was identified in faecal samples obtained from the Anubis baboon. Faecal samples obtained from the vevet monkey had no micro-organism isolated, while 100 eggs per gram of *Oesophagotomum sp* were

identified from faecal samples obtained from the putty nose monkey.

Table 1: Microbial Egg Counts in Faecal Samples of Aves

Avian	Microbial egg count (eggs per gram)	Species isolated
Goose	0	Negative
Baby Ostrich	0	Negative
Crown Crane	0	Negative
African grey parrot	0	Negative
Adult Ostrich	0	Negative
Kite	0	Negative

Negative: No microbial species isolated

Table 2: Microbial Egg Counts in Faecal Samples of Carnivores

Carnivore	Microbial egg count (eggs per gram)	Species isolated
Civet cat	500	<i>Ancylostoma spp</i>
Jackal	0	Negative

Negative: No microbial species isolated

Table 3: Microbial Egg Counts in Faecal Samples of Primates

Primates	Microbial egg count (eggs per gram)	Species isolated
Mona monkey	300	<i>Trichuris spp</i>
Patas monkey	100	<i>Strongyloides fulleborni</i>
Anubis Baboon	400	<i>Trichuris spp</i>
Vevet monkey	0	Negative
Putty nose monkey	100	<i>Oesophagotomum spp</i>
Red cap mangabey	0	Negative

Negative: No microbial species isolated

### 3.4. Microbial Egg Counts in Faecal Samples of reptiles

The result of the microbial determination of faecal samples from reptiles is shown in Table 4. 3000 eggs per grams of *Oxyuriod sp* were isolated from faecal samples of the giant tortoise, while 2400 eggs per

grams of the same microbial species was isolated from faecal samples obtained from the regular tortoise.

3.5. Microbial Egg Counts in Faecal Samples of rodents

The result of the faecal microbial determination of faecal samples from rodents is shown in Table 5. Faecal sampled from the crested porcupine and the giant rat returned no/zero identified microbes.

3.6. Microbial Egg Counts in Faecal Samples of ungulates

The result of the faecal microbial determination of faecal samples from ungulates is shown in Table 6. The Maxwell Duiker was the only ungulate present in the zoo and no microbial egg counts was recorded for faecal samples obtained from it.

3.7. Mean prevalence rate of microbes by class of animals

The results of the mean prevalence rate of the microbes based on egg counts in faeces of animals sampled showed that the most infected species were the reptiles, followed by the carnivores and the primates. Faecal samples obtained from the aves, rodents and ungulates had no microbial egg count.

Table 4: Microbial Egg Counts in Faecal Samples of reptiles

Reptile	Microbial egg count (eggs per gram)	Species isolated
Giant Tortoise	3000	<i>Oxyuriod sp</i>
Tortoise	2400	<i>Oxyuriod sp</i>

Negative: No microbial species isolated

Table 5: Microbial Egg Counts in Faecal Samples of rodents

Rodents	Microbial egg count (eggs per gram)	Species isolated
Crested porcupine	0	Negative
Giant rat	0	Negative

Negative: No microbial species isolated

Table 6: Microbial Egg Counts in Faecal Samples of reptiles

Ungulates	Microbial egg count (eggs per gram)	Species isolated
Maxell Duiker	0	Negative

Negative: No microbial species isolated

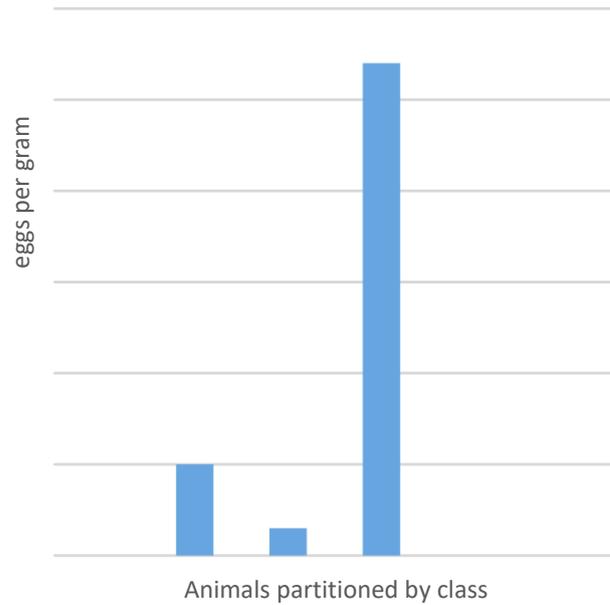


Figure 2: Prevalence rate of microbes by class of animals

4. DISCUSSION

The prevalence of the identified microbial species in the faeces of the animals can be caused by a number of factors associated with captive managed animals, similar to the report of Atanaskova *et al.*, (20110). Since not all class of animals were infected, the present study suggests host or class specific associations of the microbes, this is because the microbes isolated were attached to a particular class or animal as observed by Singh *et al* (2009). It could also be hypothesized that the animals may have been infected with the microbes before they were captive managed and that may be proper diagnosis, treatment and cure of the animals were not conducted. This is similar to the observation of Thawit et al (2014).

Since not all the sampled animals were infected by the microbes, the mode by which the infected animals could have contacted the microbes isolated in their faeces could have been food sources, since each class of animals were fed with different diets. If food was the major source of infection, then it may have been that non-hygienic or unsuitable food may have been the mode wherein the microbes were transferred to the animals, as observed by Opara, *et al* (2010) or if the animals were allowed to consume left over feed from the previous day, could also be part of the reason for the presence of the microbes in their faeces, this supports the findings of Adeniji (2014). Environmental concerns could also be another entry path for the micro-organisms isolated. Nemat *et al.* (2015) had reported that animals can be infected with microbial organisms through environmental interactions. This

could be another entry mode of the microbes especially for the reptiles. Perhaps the Zoo keepers did not regularly/often clean or remove faecal materials dropped by the reptiles which also could have been a major source of infection. If this is true, then interactions of the animals with a polluted environment might have aided the entry of the micro-organisms isolated in their faeces. Proper supervision of cleaning routines of the captive managed animals should be ensured. Proper hygienic principles when feeding the animals should be followed. The reptiles, carnivores and primates should be properly treated against the identified microbes

## 5. CONCLUSIONS

The following conclusions were drawn from the result of the present study:

1. Microbes identified were host specific
2. Reptiles were the mostly affected animals followed by carnivores and primates.
3. The aves, ungulates and rodents were not infected.

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