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## DISEASES OF ZOO ANIMALS IN NIGERIA

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**Abstract:** In a 4 year period, 77 zoo animals were brought to our diagnostic laboratory. Twenty-six of the 77 animals had diagnostic lesions. Of the diseases of primates, *Herpes simplex* encephalitis, pyrrolizidine alkaloid poisoning and osteodystrophia fibrosa were prominent. Hydatidosis, trypanosomiasis and myopathies were significant diseases in wild ruminants. Rabies was diagnosed in a lynx. The significance of these diseases to public health and epidemiology, is discussed.

### INTRODUCTION

The study of diseases of wild animals is important to public health and to comparative pathology and medicine. Johnson<sup>1</sup> emphasized that diseases of wild animals in aberrant hosts (domestic animals or man) may result in epidemics of disease with high mortality. Frame *et al.*<sup>2</sup> inferred that lassa fever, a highly virulent virus-induced disease in man in Nigeria, characterized by myocarditis, pneumonia, pleuritis and encephalopathy, might have spread from non-human forms of animal life to the poorly adapted human host. In recent years, as pointed out by Leader<sup>3</sup> there has been an interest in the search for animal models for human diseases. Some of the parasites found in animals in Ibadan University Zoo have been documented.<sup>2</sup> However, the authors are not aware of any reports in the literature dealing specifically with diseases of zoo animals in Nigeria. This report presents a summary of diseases of zoo animals diagnosed in our laboratory in a four-year period, 1967-1971.

### MATERIALS AND METHODS

Postmortem examinations were performed on zoo animals submitted to the diagnostic laboratory. Tissues, collected at necropsy, were fixed in 10% formalin, embedded in paraffin, sectioned at 6 microns and stained with haematoxylin and

eosin. Bacterial culture, virus isolation and serological tests were performed when needed to confirm morphological diagnoses.

### RESULTS

In the 4 year period, 1967-1971, a total of 77 wild animals were received. Of these, 23 were primates, 24 ruminants, eight carnivores, four rodents, four birds and nine other mammals. Twenty-six of 77 animals had diagnostic lesions.

#### Diseases of Primates

Diseases diagnosed in primates are summarized in Table 1. Nonsuppurative polioencephalomyelitis and meningitis was diagnosed in two patas monkeys (*Erythrocebus patas*). The clinical signs included tremor of the head and forearms, and facial nerve paralysis. Histologically, the spinal cord and brain lesions were characterized by microglial nodules, and by accumulation of mononuclear cells in perivascular spaces in the brain parenchyma and meninges.

Haemorrhagic encephalitis was observed in a baboon (*Papio anubis*) which had bitten its owner.

Osteodystrophia fibrosa was diagnosed in a 1-year-old female potto lemur (*Perodictus potto*). The gross lesions were "rubbery" bones.

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TABLE 1. Diseases of Primates

Disease	No. of Animals	Host	Source
<i>Unknown aetiology</i>			
Nonsuppurative polioencephalomyelitis	2	Patas monkey	University of Ibadan Zoo
Cerebral malacia	2	Patas monkey	University of Ibadan Zoo
Bronchopneumonia	1	Patas monkey	University of Ibadan Zoo
Haemorrhagic encephalitis	2	Baboon	Private Owner, Ibadan
Meningitis	1	Patas monkey	University of Ibadan Zoo
<i>Metabolic</i>			
Osteodystrophia fibrosa	1	Lemur	University of Ife Zoo
<i>Toxic</i>			
Pyrrizolidine alkaloid poisoning	1	Mangabeg monkey	University of Ife Zoo
<i>Viral</i>			
Herpes encephalitis	3	Lemur	University of Ibadan Zoo

Lesions morphologically consistent with a diagnosis of pyrrolizidine alkaloid poisoning, were found in a 2-year-old Mangabeg monkey (*Cercocebus torquatus*). Gross lesions were yellow oral mucous membranes and mottled liver. Histologically, the liver lesions consisted of proliferation of fibroblasts and mononuclear cells around portal triads, proliferation of bile ducts, and hypertrophy of bile duct epithelium. Other lesions of the liver included reduction in the number of hepatocytes, hypertrophy of hepatocytes and the presence of acidophilic globules in the cytoplasm of hepatocytes.

Herpes encephalitis was diagnosed in three potto lemurs on the basis of histological lesions and mouse inoculation. The first case had nervous signs and diarrhoea. It became moribund and was killed for necropsy. Histologically, there was localized encephalitis in the diencephalon, with swelling and proliferation of endothelial cells of blood vessels, which in addition were cuffed with mononuclear cells. Also, there was malacia and proli-

feration of glial cells. The more specific lesion, however, was the presence of eosinophilic intranuclear inclusion bodies in glial cells. The other two cases, showed nervous signs, incoordination and circling. Histologically, there was evidence of encephalitis and meningitis.

Suckling mice which were inoculated with brain tissue from infected lemurs died with lesions characterized by necrotizing encephalitis, meningitis, malacia, and intranuclear inclusion bodies in glial cells. The viral agent was confirmed serologically as *Herpes simplex*.

Meningitis of unknown aetiology was diagnosed in a patas monkey.

#### Diseases of Wild Ruminants

The diseases of wild ruminants are summarized in Table 2. The lesions of muscular dystrophy observed in a 2-week-old bush buck (*Tragelaphus scriptus*) were grossly, large white foci in the quadriceps muscles and histologically, extensive necrosis and dystrophic calcifica-

TABLE 2. Diseases of Wild Ruminants

Disease	No. of Animals	Host	Source
<i>Unknown aetiology</i>			
Fibrinous pericarditis	1	Duiker	University of Ibadan Zoo
Necrotic endocarditis and myocarditis	1	Duiker	University of Ibadan Zoo
Bronchopneumonia	2	Duiker	University of Ife, Zoo
Meningitis	1	Duiker	University of Ibadan Zoo
Hepatitis	1	Duiker	University of Ibadan Zoo
Muscular dystrophy	1	Bushbuck	University of Ibadan Zoo
<i>Bacterial</i>			
Actinomycosis	1	Duiker	University of Ibadan Zoo
<i>Parasitic</i>			
Hydatidosis	1	Camel	University of Ibadan Zoo
Trypanosomiasis	1	Gazelle	University of Ibadan Zoo

tion. The endocardial and myocardial lesions in a duiker (*Cephalophus rufilatus*) were grossly evident as focal, pale-yellow necrotic areas, 2-3 mm in diameter.

A 3-year-old duiker had intense fibrinous pericarditis with yellow, foam-like fibrinous exudate in the pericardial sac. Similar exudate was found on the visceral surfaces of the lung and on the thoracic pleura. In two other duiker there was metastatic focal fibrinous pneumonia accompanying extensive suppurative lesions of the feet. Abscesses, with extensions to tendons and bone, were found in the forefeet. Other conditions, diagnosed in duikers include actinomycosis and hepatitis.

A camel (*Camelus dromedarius*) with a clinical history of a digestive disorder, had hydatid cysts (*Echinococcus granulosus*) 3-5 cm in diameter in the liver, spleen and lungs. Peritonitis, evidenced grossly by fibrin tags and 3 litres of fluid in the peritoneal cavity, was also present.

Trypanosomiasis was diagnosed in a gazelle (*Gazelle rufifrons*). Clinical signs included lethargy and muscle weakness. A large number of pleomorphic trypanosomes of an unidentified species were observed in Giemsa-stained blood smears.

On postmortem examination the spleen was found to be enlarged and hyperaemic. Histologically, there was acute glomerulonephritis, characterized by protein casts in tubules and focal acute necrosis of tubules. There were accumulations of trypanosomes in the renal interstitial blood vessels. The hepatic cells were swollen, with cytoplasmic accumulations of globular eosinophilic material. A few trypanosomes were present in the hepatic sinuses. The spleen was congested and the red pulp completely disrupted.

#### Diseases of Carnivora

Rabies was diagnosed in a 5-year-old lynx (*Felis caracal*) on the basis of mouse inoculation and histology. Clinical signs of rabies in the lynx included convulsions and vomiting. At necropsy, there was vomitus around the mouth and nostrils. Dark-red depressed areas were observed in the apical lobe of the right lung. Histologically, encephalitis was evidenced by moderate accumulation of mononuclear cells in the perivascular spaces of the brain stem. Eosinophilic intracytoplasmic inclusion bodies were observed

in Purkinje cells of the cerebellum and in the neurons of the hippocampus.

*Escherichia coli* septicaemia was diagnosed in an otter (*Lutra capensis*). Clinical signs included anorexia and staggering. The lymph nodes were grossly enlarged and haemolytic *E. coli* was isolated from the spleen, brain, and lymph nodes. In lymph nodes, massive bacterial colonies were associated with extensive necrosis of tissues. Anaemia was diagnosed in a civet (*Civettictis civetta*).

#### Diseases of Rodents

Verminous pneumonia was diagnosed on histopathological examination of the lung of a porcupine (*Atherurus africanus*). The lesions were characterized by a chronic granulomatous reaction around the nematode parasite, which was not identified. A brain abscess of unknown aetiology was found in a squirrel (*Citellus variegatus*).

#### DISCUSSION

Of the viral diseases, herpes virus infection in lemurs and rabies in the lynx have significance in public health. The lemurs were brought to the Ibadan zoo from Madagascar and South Africa. The exact source of the virus is not known. However, it would appear that humans handling the food of the lemurs, or visitors watching them, might have passed the virus to the lemur. The transmission of infectious agents from man to animals is a well known phenomenon, though less publicized than the reverse. The pathogenicity of *Herpes simplex* for other sub-human primates: owl monkey (*Adus trivirgatus*), rhesus monkey (*Macaca mulatta*) and gibbon (*Hylobatus lar*), have been documented.<sup>8,10</sup>

The epidemiology of the rabies infection in the lynx poses an intriguing question. The lynx had been in the zoo for more than a year before the disease was diagnosed. It is therefore unlikely that the animal was infected before it was placed in the zoo. Furthermore, the lynx was caged with three others which did not develop clinical signs of rabies. Since

there is a high incidence of rabies in the Nigerian animal population, there is the possibility that the lynx could have been bitten by a rabid bat which could have had access to the cage.

The lesion of nonsuppurative polioencephalomyelitis and meningitis in the patas monkey is consistent, morphologically, with that of viral encephalitis.<sup>6</sup> Haemorrhagic encephalitis in a baboon (*Papio anubis*) has been reported as a component in the lesions of Rickettsial infections.<sup>8</sup>

The lesions of trypanosomiasis in the gazelle were severe enough to be the cause of death. Our observations are consistent with those of Baker<sup>1</sup> that gazelle are susceptible to fatal trypanosomiasis. Woo and Soltys<sup>11</sup> explained the susceptibility on the basis that gazelle are not fed upon to any extent by tsetse flies in nature. The species of trypanosomes observed in the gazelle was not identified at the time, but was probably *Trypanosoma vivax*, judged by the large numbers seen in blood smears and in blood vessels in tissue section.<sup>6</sup> The role of wildlife as a reservoir of trypanosomes for domestic animal and man, needs to be elucidated.

The severity of the hydatidosis in the camel is evidenced by the occurrence of hydatid cysts in several organs. The source of infection is not known. The meat of infected camels would be a source for spread of fertile hydatids to carnivora and thus eventual spread of the disease to domestic animals and human populations.

Megalocytosis, with the formation of cytoplasmic globules in the liver of the mangabeg monkey is morphologically consistent with the lesions of pyrroizidine alkaloid poisoning in animals which have consumed plants in the genera *Senecio*, *Crotalaria* and *Heliotropium*.<sup>6</sup> The case history did not indicate the possible source of the poison. The possible susceptibility of non-human primates to pyrroizidine alkaloid poisoning might imply that the use of plants containing pyrroizidine alkaloids as medicinal herbs could result in poisoning in rural human populations.

The degenerative lesions in the quadriceps muscles in the bushbuck and in the muscles of the heart of a duiker were morphologically similar to the lesions of vitamin E or selenium deficiencies.

Further studies of the diseases of zoo and other wild animals might contribute to better understanding of the epidemiology of diseases in man and domestic animals.

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