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### Original article

## Detection of rabies antigens in the brain tissues of jackals and mongooses and its implications on public health and conservation goals in Bauchi state, Nigeria

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#### ABSTRACT

One year survey of rabies was carried out among wildlife in villages surrounding yankari and Lame-bura game reserves in Bauchi State, Nigeria. Brain samples from 76 Jackals and 18 mongooses were collected from markets, road killed, homestead and farm lands killed. A total prevalence of 9.6% was observed in which rabies antigens were detected in 7 (9.2%) jackals and 2 (11.1%) mongooses using Fluorescent Antibody Test (FAT). Wildlife could feature significantly in the epidemiology of rabies in the study area and the wide practice of wildlife meat consumption known as 'bush meat' have prompted farmers and poachers to rampant attacks on wildlife species to meet the market demand for the bush meat thereby increasing the potentials of rabies spread in the area. This is of immense public health concern and a challenge to conservation goals.

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## 1. Introduction

Rabies remains a global zoonosis of major public health, agricultural and economic significance. Domestic dogs serve as the major reservoirs and principal source of rabies virus transmission to humans and other animals in many developing countries of the world (WHO, 1999). Other domestic and wild animals are typically infected through secondary transmission of rabies virus variants that are maintained by dogs or in some cases variants of rabies virus maintained by wild carnivore hosts traceable to a domestic dog origin (Real and Childs, 2005).

In North America and Europe, wildlife species have replaced dogs as the most important reservoirs of rabies and new viral etiologic agents continue to emerge (Reppretch et al., 2006). Canine rabies represents an important risk for humans in most African Countries (Nel et al., 1993). Although, sporadic rabies cases in wild mammals (Wildcats, Wild dogs, Monkeys, Bats, Rodents, Jackals, Hyenas,) have been documented throughout the African continent (Cliquet and Picard –Meyer, 2004) the disease has not been extensively studied in Nigeria.

In Nigeria, the domestic dog is still regarded as the primary reservoir host for rabies affecting humans and animals (Boulger and Hardy, 1960, Ezeokoli and Umoh 1987; Ogunkoya 2003). However, there has been a low but consistent number of positive cases from wildlife species which were reported over the years in caracal lynx (Isoun et al., 1972; Okoh, 1976), Civet cat (Kisali 1977; Enurah et al., 1988), Insectivorous bats (Dzikwi et al., 2010).

Human consumption of wildlife meat known as “bush meat” is widely practiced in Nigeria. However, there is limited information on the public health implications of these practices and threat it poses to wildlife conservation. The epidemiology of rabies is directly associated with the ecology of the reservoirs which needs better understanding in order to design appropriate control measures (Kitala et al., 2001). The survey was performed to obtain baseline information necessary to begin assessment of the epidemiologic situation, circulation patterns and public health significance of rabies among wildlife species in Bauchi State, Nigeria.

## 2. Materials and methods

### 2.1. Study area

The study was conducted in Bauchi State, located between longitude 9° 15'E to 10° to 43'E and latitude 9° 55'N to 12° 45'N in the Northern Guinea/Sudan savannah zone of Nigeria. Bauchi State is considered home of tourism because of the presence of the Yankari, Lame-Bura Game reserves and the Sumu wildlife park with many other forest reserves which harbor many wildlife species. The intensive study area comprises of three districts (Gwana, Duguri and Pali) surrounding the Yankari game reserve and two districts (Lame and Burra) surrounding Lame- burra game reserve in Bauchi State, Nigeria.

### 2.2. Sample collection

Seventy six (76) heads of jackals and eighteen (18) heads of mongooses were obtained from markets, road killed, homestead and farm lands killed. The rangers from the game reserves assisted in collecting the samples during their patrol activities in villages surrounding Yankari game reserve and Lame - burra game reserve in Bauchi State, Nigeria. The brain samples collected were stored at -20° c until analyzed at the National Veterinary Research Institute Vom, Nigeria. All brain samples were tested for the presence of rabies virus antigens by the direct fluorescent antibody (DFA) test, as described by (Dean et al., 1996). Touch- brain impressions were made on 4-well, Teflon-coated slides. The slides were fixed in cold acetone, air dried, and stained with fluorescein isothiocyanate (monoclonal antibody FITC-conjugate Catalog Number 5100 reagent Chemicon International Inc. 1-800-437-7500) and incubated for 30 minutes at 37°C. The slides were then rinsed four times in distilled water for about 5 minutes to remove the unbound DFA reagent from the smears. The stained smears were examined at x20 magnification for the presence of clusters of apple green fluorescence indicating the presence of rabies antigen. Contrary results indicated absence of rabies antigen.

## 3. Results and discussion

Of the 76 brain samples collected from Jackals, 7(9.2%) samples were positive for rabies antigen and also, of the 18 brain samples collected from mongooses 2(11.1%) samples were positive for rabies antigen. A total prevalence of 9.6 % was obtained during the survey.

The result obtained from this study have shown rabies prevalence rate of 9.6% in Jackals and Mongooses, this serves as further confirmation of our lack of understanding of the incidence and host range of rabies in Nigeria. Such infections with the virus have been reported in South Africa in the mongooses (Nel et al., 2005; Markotter et al., 2006) and jackals (Bingham et al., 1999; Zulu et al., 2009). Although Nigeria is particularly important for lyssavirus surveillance because the initial isolation of Lagos bat virus and Mokola virus occurred in the country, poor surveillance of rabies and poor diagnostic capability are large contributors to our lack of information and the obscurity of lyssaviruses in the country.

**Table 1**

Occurrence of rabies antigen using FAT carried out on the brain tissues of Jackals and Mongooses in Bauchi State, Nigeria.

Animal specie	Samples collected	Samples positive	Prevalence
Jackal	76	7	9.2
Mongoose	18	2	11.1
Total	94	9	9.6

P Value 0.6809, OR 0.8116, CI (0.1538- 4.283).



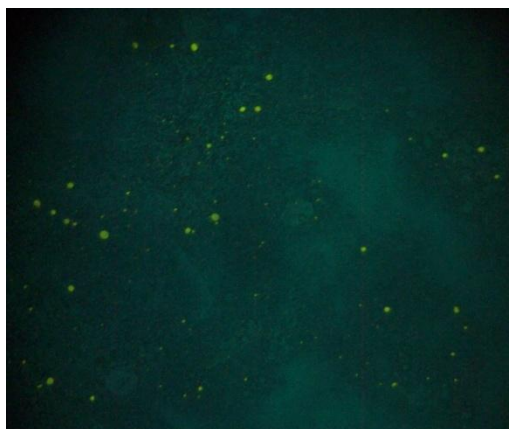
**Plate I.** Photograph of head of jackal (*Canis aureus*).



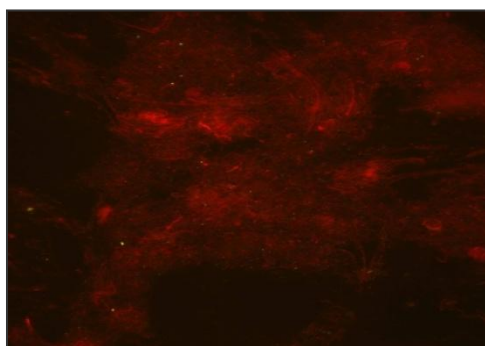
**Plate II.** Photograph of a jackal (*Canis aureus*) Killed in a farm land.



**Plate III.** Photograph of head of a mongoose (Mungos mungo).



**Plate IV.** A photomicrograph (x20) following DFA test indicating a clear positive reaction on brain tissue sample from jackal. (Aliquots of the DFA reagent diluted in ratio of 1,40 in PBS).



**Plate V.** A photomicrograph indicating a negative reaction due to absence of fluorescence from brain tissue sample from jackal. (Aliquots of the DFA reagent diluted in 1,40 in PBS).

The earlier reports by (Macdonald, 1993; Cliquet and Picard-Meyer, 2004; Dzikwi et al., 2010) as well as the present report have indicated that there is increasing incidence of rabies in both domestic and wild animals especially in Africa. This is of great concern considering the public health implication of the disease.

Human activities at the fringes of the game reserves in Bauchi State allow for dogs ownership which are mainly used for hunting purposes and provision of security to livestock and farm crops from wildlife. It is likely that the rabies antigens detected in jackals and mongooses resulted from spill-over from dogs as they are known to be the major reservoir host of rabies in Nigeria (Ezeokoli and Umoh 1987; Ogunkoya, 2006) and majority of the dogs around the reserves are not adequately taken care of in terms of vaccination, feeding and provision of shelter and mostly roam about to scavenge for food creating opportunities for contact with wildlife. It is also important to note that while dog's impacts to wildlife is likely to occur at individual level the results may still have important implications for wildlife populations.

The result of the finding in which Jackals and Mongooses are showing evidence of rabies antigens is strongly suggestive that the virus could be actively circulating within the wildlife populations and also indicative of the possibility that wildlife could feature significantly in the epidemiology of rabies in Bauchi State, Nigeria. This is of immense concern considering the fact that the practice of wildlife capture and translocation to zoos, parks and homesteads is on the increase in Nigeria and Yankari game reserve is known to be the major source of these wildlife species there by increasing the potentials of rabies spread among wildlife species in the country.

It is also important to note that the DFA test used in detecting the rabies antigen in Jackals and Mongooses during this study could only indicate the presence of rabies antigens but not differentiate between the different lyssavirus genotypes. Antigenic typing and Genetic Characterization are necessary to identify lyssavirus precisely. These techniques are beyond the capability of most laboratories in Nigeria. However, further studies are intended to isolate and characterize the virus in jackals and mongooses in which rabies antigens were detected.

About 8,884 heads of livestock and over 500 farm lands and human settlements were estimated in the conservation area of Yankari Game Reserve (Omondi et al., 2006). This shows that there is high level of human activities around the game reserves and presents issues of conflicts which are of public health and environmental concern considering the fact that the source of samples for this study were mainly heads of apparently healthy wildlife species illegally hunted and sold in markets for human consumption as 'bush meat'. Both the hunters and the bush meat handlers are at risks of rabies infection. Also, as observed during the study a farmer killed four jackals when he met them feeding on fruits and insects on his beans farm. This and many other issues of conflicts are on the increase around the reserves and constitute a continuous threat to wildlife conservation.

#### **4. Conclusion**

The detection of rabies antigens from brains of hunted jackals and mongooses meant for human consumption in markets as 'bush meat' is indicative of the possibility that wildlife could feature significantly in the epidemiology of rabies in Bauchi State, Nigeria and this is of serious public health risks and a challenge to conservation goals. There is therefore the need for much more studies of sylvatic rabies and molecular characterization and phylogenetic analysis of isolates to establish the true reservoirs of the disease in the country. The need to educate the general public on the dangers of rabies and the importance of the game reserves (wildlife) to the communities cannot be overemphasized.

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