



Original Scientific Article

**PRESENCE OF TRYPANOSOME SPECIES AND ANEMIC STATUS OF DOGS IN ZURU, NIGERIA**Rafi Rabeca Tono<sup>1</sup>, Olufemi Oladayo Faleke<sup>2</sup>, Abdullahi Alhaji Magaji<sup>2</sup>,  
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**ABSTRACT**

The aim of this research is to study the presence and prevalence of trypanosome species in local dogs between January and July, 2010 in the Zuru area of Kebbi State, Nigeria. Standard trypanosome detection methods comprising of wet blood films, thin films and microhaematocrit centrifugation technique were used to detect trypanosomes; while the degree of anemia was determined through the use of FAMACHA® eye colour chart and packed cell volume values. A total of 567 dogs were enumerated in fourteen locations within the study area out of which 192 (33.7%) were randomly examined and 4 (2.08%) were positive for the presence of trypanosomes. All positive samples morphologically belong to the *Trypanosoma brucei* group. The obtained PCV values showed that 50 (26.04%) dogs were anemic, while the FAMACHA® detected anemia status of varying degrees in 104 (77%) sampled dogs. These findings are significant as this is the first time that the trypanosome infection will be reported in dogs from the study area. This study establishes the presence of *Trypanosoma brucei* group in the study area, which is of zoonotic and economic importance.

**Key words:** anemia, dogs, Nigeria, trypanosomes, Zuru**INTRODUCTION**

Trypanosomiasis is an important insect-borne protozoan disease and a serious constraint to livestock production and economic development in many parts of sub-Saharan Africa (1). It is widely distributed in tropical and subtropical regions and

its epidemiology is determined by the ecology of its insect vector, the tsetse fly (*Glossina* spp). Canine trypanosomiasis is a devastating disease (2) characterized by anemia, severe weight loss, muscular weakness, abortion, corneal opacity, blepharitis, conjunctivitis, keratitis and death if untreated in affected dogs (3). Trypanosomiasis of dogs was first described in 1908 (4) and it is caused mainly by *Trypanosoma brucei brucei* (5), *Trypanosoma congolense* (6), *Trypanosoma cruzi* (7), *Trypanosoma evansi* (8) and *Trypanosoma caninum* (9). In Nigeria, trypanosomiasis in dogs due to *T. brucei* and *T. congolense* occurs more frequently (10). It has been established that different domestic animals including dogs are potential links for trypanosome exchange between livestock and humans i.e. *Trypanosome brucei gambiense* and *Trypanosome brucei rhodesiense*,

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causing a condition known as HAT, also referred to as 'sleeping sickness (11, 12, 13), while *T. brucei brucei* causes severe to fatal infections in horses, camels, dogs and cats (14).

There has been increased interest in keeping dogs in Nigeria, mainly as security or pets, and in some parts of the country for food. Similarly, the proceeds from the sales of dogs serve as additional income for the owners (15). Though dogs are known to pose minimal risk for human infection (HAT), they are important as a sentinel for infection (13). Canine trypanosomiasis has been reported as constituting a major health threat to canine population in the south-eastern part of Nigeria (10, 11, 16).

The study area is an interface between the hitherto declared 'tsetse-free' zone of the northwest and tsetse endemic areas southward in the middle belt of Nigeria. The people in the study area are predominantly crop farmers whose activities are restricted to the short period of rainfall. The long dry season is used mainly for hunting in which the expeditions takes them south, where tsetse flies abound (17). The study therefore investigated possible incursion of trypanosomes to the study area through dogs.

## MATERIAL AND METHODS

### *Study Area*

The study was undertaken in the Zuru Local Government Area, south-eastern part of Kebbi State, northwest, Nigeria. It lies within latitudes 11°15' to 11°55'N and longitudes 4°35' to 5°47' E and falls within the Sudan Savannah type of vegetation, with a mean annual rainfall of 1022 mm and a mean minimum and maximum temperatures of 24.6°C and 28°C respectively. The dominant group is the Lelna people whose economic activities center on crop and livestock production, with some engaging in hunting expeditions southward towards Niger and Kwara States of Nigeria. A preliminary census of household dog population was conducted in 14 selected locations using a purposive sampling method, while the dogs were sampled by a convenience sampling technique. Within the study area a representative sample size was determined using the formula:  $n = Z^2PQ/L^2$ . Where n = number of individuals; Z = the Z score for a given confidence interval (95%); for this study, since there was no known prevalence for canine trypanosomiasis in the study area, P was estimated at 20%; Q = 1 - P and L = is the allowable error of estimation (5%) (18). Using this formula, 167 dogs are to be sampled but

this was increased to 192 so as to increase precision. Dogs from a dog market within the study area were also sampled. Structured questionnaire comprising of information on dog usage and maintenance was designed and administered to owners in the sampled households only in relation to the veterinary health care delivery system.

About 3ml of blood was collected from the cephalic vein from each of the dogs that were sampled, using 5ml sterile syringe and needle and transferred into clean EDTA bottles. The blood in each bottle was gently mixed, placed in a cool box containing ice packs and transported in about 2hrs to the Veterinary Public Health and Preventative Medicine laboratory of Usmanu Danfodiyo University Sokoto, Nigeria for immediate analysis. The blood samples were then examined using the standard trypanosome diagnostic methods (STDMD) comprising of wet blood films, thin films and microhaematocrit centrifugation technique (19, 20). Morphological identification of trypanosomes was carried out using Giemsa stained films. Packed cell volume (PCV) was determined to detect level of anemia [normal PCV range 36 - 55%] (21), while FAMACHA®, an eye colour chart with five colourscores [scores: 1=optimal, no anemia; 2=acceptable, no anemia; 3=borderline, moderate; 4=dangerous, anemic and 5=fatal, anemic] (22) were used to diagnose different levels of anemia.

### *Ethical approval*

Ethical clearance as approved by the Research Ethical Committee of the Faculty of Veterinary Medicine, Usmanu Danfodiyo University Sokoto, Nigeria was obtained prior to this study.

### *Statistical Analysis*

Descriptive statistics was used to analyze data (23).

## RESULTS

Preliminary census enumerated a total number of 510 Nigerian local breed of dogs from households in 14 locations namely: Bayan Tasha, Filin Jirgi, Gomawa, Jarkasa, Low cost, Mangorori, Rikoto, Roadblock, Sabuwar Kasuwar, Sha da Wanka, Tudun Wadata, Unguwar Zuru, Zango, Zuru Center and a dog market. As shown in Table 1, Rikoto had the highest number of dogs (n=77), while Mangorori had the lowest (n=11). A total of 192 Nigerian dogs were selected comprising of 135 dogs from the households and 57 dogs from the dog market.

**Table 1.** Dog population structure with the number of sampled and positive cases in households and dog market in Zuru area, Kebbi State

| Location       | Enumerated | Sampled No. | Percentage sampled (%) | Positive samples |
|----------------|------------|-------------|------------------------|------------------|
| Bayan Tasha    | 18         | 5           | 27.8                   | -                |
| Dog market     | 57         | 57          | 100.0                  | 1                |
| Filin Jirgi    | 42         | 11          | 26.2                   | 1                |
| Gomawa         | 27         | 6           | 22.2                   | -                |
| Jarkasa        | 46         | 13          | 28.3                   | -                |
| Low Cost       | 27         | 6           | 22.2                   | -                |
| Mangorori      | 11         | 3           | 27.3                   | -                |
| Rikoto         | 76         | 22          | 28.9                   | 1                |
| Roadblock      | 39         | 10          | 25.6                   | -                |
| Sabuwar Kasuwa | 41         | 11          | 26.8                   | -                |
| Sha da wanka   | 42         | 11          | 26.2                   | -                |
| Tudun Wadata   | 39         | 10          | 25.6                   | -                |
| Unguwar Zuru   | 49         | 14          | 28.6                   | 1                |
| Zango          | 20         | 5           | 25.0                   | -                |
| Zuru Centre    | 33         | 8           | 24.2                   | -                |
| <b>Total</b>   | <b>567</b> | <b>192</b>  | <b>33.7</b>            | <b>4(2.08%)</b>  |

Out of 192 blood samples analyzed by STDM, 4 (2.08%) were positive for trypanosomes. Out of these wet blood film detected all the 4 positive cases, microhaematocrit detected 3, while Giemsa stain (thin blood) technique detected 2 (Table 2).

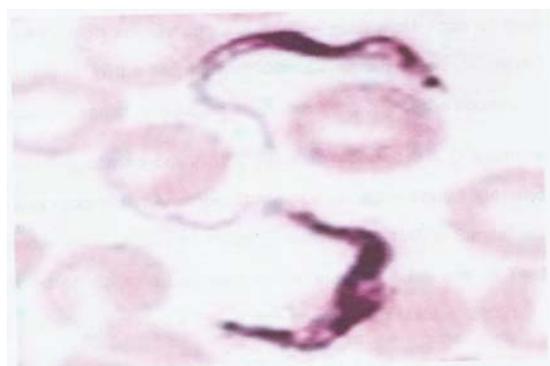
The PCV values ranges and FAMACHA scores of all sampled animals were not consistent with their anemic statuses. According to PCV values, of the 192 dogs examined 50 (26.04%) dogs were anemic (21), with 3 (1.56%) being positive for trypanosomes

**Table 2.** Distribution of positive samples and anemic indicator values

| Areas        | PCV (%) | WBC   | RBC (%) | Hb   | FAMACHA Score | Wet blood | Haematocrit | Thin blood |
|--------------|---------|-------|---------|------|---------------|-----------|-------------|------------|
| Dog market   | 34      | 12.40 | 3.10    | 10.3 | NC            | +         | +           | +          |
| Filin Jirgi  | 32      | 10.02 | 3.23    | 10.7 | 4             | +         | +           |            |
| Rikoto       | 36      | 4.88  | 5.43    | 12.0 | 4             | +         | +           | +          |
| Unguwar Zuru | 24      | 3.25  | 4.73    | 8.0  | 4             | +         | -           | -          |

**Key:** NC = Not conducted

Morphologically, all the positive samples were identified to be in the *Trypanosoma brucei* group (Fig. 1).

**Figure 1.** Giemsa stained *Trypanosomabrucei* thin film smear

and 47 (24.47%) negative for trypanosome infection, while out of 142 (73.95%) non-anemic dogs, 1 (0.52%) was positive for trypanosomes and 141 (73.43%) were negative (Table 3). Of the 135 household-dogs sampled, FAMACHA® gave a total of 104 (77%) dogs with anemia. FAMACHA® testing was not done for dogs from the dog market (Table 4).

All the 135 respondents claimed that their dogs were kept mainly for security purposes and it was observed that dogs were mostly unleashed and found roaming about in the study area. As shown on Table 5, 21 (15.6%) of the respondents feed their dogs occasionally, 74 (54.8%) did not vaccinate their dogs against any disease, only 5 (3.7%) have their dogs receive regular veterinary health care services, while 53 (39.3%) have dogs infested with ticks and 86 (63.7%) having to dispose their dogs

**Table 3.** Anemic status of examined dogs at different locations in Zuru using PCV

| Locations     | Trypanosomal negative |                    | Trypanosomal positive |                 | Total      |
|---------------|-----------------------|--------------------|-----------------------|-----------------|------------|
|               | Anemic                | Non- anemic        | Anemic                | Non- anemic     |            |
| Bayan Tasha   | 2                     | 3                  | -                     | -               | 5          |
| Dog market    | 2                     | 36                 | 1                     | -               | 57         |
| Filin Jirgin  | 2                     | 8                  | 1                     | -               | 11         |
| Gomawa        | 2                     | 4                  | -                     | -               | 6          |
| Jarkasa       | 1                     | 12                 | -                     | -               | 13         |
| Low Cost      | 0                     | 6                  | -                     | -               | 6          |
| Mangorori     | 2                     | 1                  | -                     | -               | 3          |
| Rikoto        | 6                     | 15                 | -                     | 1               | 22         |
| Roadblock     | 1                     | 9                  | -                     | -               | 10         |
| SabuwarKasuwa | 2                     | 9                  | -                     | -               | 11         |
| Sha da wanka  | 3                     | 8                  | -                     | -               | 11         |
| Tudun Wadata  | 0                     | 10                 | -                     | -               | 10         |
| Unguwar Zuru  | 1                     | 12                 | 1                     | -               | 14         |
| Zango         | 2                     | 3                  | -                     | -               | 5          |
| Zuru Centre   | 3                     | 5                  | -                     | -               | 8          |
| <b>Total</b>  | <b>47(24.47%)</b>     | <b>141(73.43%)</b> | <b>3(1.56%)</b>       | <b>1(0.52%)</b> | <b>192</b> |

**Table 4.** Anemic status of examined dogs at different locations in Zuru using FAMACHA®

| Locations     | Trypanosomal negative |                   | Trypanosomal positive |                | Total      |
|---------------|-----------------------|-------------------|-----------------------|----------------|------------|
|               | Anemic                | Non- Anemic       | Anemic                | Non- anemic    |            |
| Bayan Tasha   | 5                     | 0                 | -                     | -              | 5          |
| Dog market    | NC                    | NC                | NC                    | NC             | NC         |
| Filin Jirgin  | 5                     | 5                 | 1                     | -              | 11         |
| Gomawa        | 6                     | 0                 | -                     | -              | 6          |
| Jarkasa       | 7                     | 6                 | -                     | -              | 13         |
| Low Cost      | 4                     | 2                 | -                     | -              | 6          |
| Mangorori     | 3                     | 0                 | -                     | -              | 3          |
| Rikoto        | 13                    | 8                 | 1                     | 0              | 22         |
| Roadblock     | 9                     | 1                 | -                     | -              | 10         |
| SabuwarKasuwa | 11                    | 0                 | -                     | -              | 11         |
| Sha da wanka  | 11                    | 0                 | -                     | -              | 11         |
| Tudun Wadata  | 7                     | 3                 | -                     | -              | 10         |
| Unguwar Zuru  | 11                    | 2                 | 1                     | -              | 14         |
| Zango         | 3                     | 2                 | -                     | -              | 5          |
| Zuru Centre   | 6                     | 2                 | -                     | -              | 8          |
| <b>Total</b>  | <b>101(74.81%)</b>    | <b>31(22.96%)</b> | <b>3(2.22%)</b>       | <b>0(0.0%)</b> | <b>135</b> |

NC = Not Conducted.

**Table 5.** Responses to the questionnaire survey on dog management within Zuru

| Sampled questions                     | No. of Responses         |                       |                            |
|---------------------------------------|--------------------------|-----------------------|----------------------------|
| Purpose for keeping dog               | Security 135(100%)       | Commercial (Nil)      | Hobby/Pet (Nil)            |
| Duration of keeping dog sampled       | 1 month-1 year 12(9.8%)  | 2-5 years 31(23.0%)   | 6 year and above 93(68.9%) |
| Mode of feeding                       | More than once 92(68.2%) | Once daily 22 (16.3%) | Some times 21(15.6%)       |
| Anti-rabies vaccination               | Regularly 5(3.7%)        | Sometimes 56 (41.5%)  | Not at all 74(54.8%)       |
| Acquaintance with veterinary services | Regularly 5(3.7%)        | Sometimes 64 (47.4%)  | Not at all 66(48.9%)       |
| Preference to sex during purchase     | Yes 6(4.4%)              |                       | No 129(95.6%)              |
| Owing other breeds                    | Yes 3(2.2%)              |                       | No 132(97.8%)              |
| Reasons leading to dog disposal       | Harassment 23(17.0%)     | Illness 86 (63.7%)    | Accidents 26(19.3%)        |
| Presence of ectoparasites             | Yes, (ticks) 53(39.3%)   |                       | No 82(60.7%)               |

due to illness. Virtually all adult dogs were involved in hunting expedition during the dry season period. The hunting for game animals goes beyond the boundary of Zuru Emirate, it extends southwards into Niger and some parts of Kwara States, Nigeria.

## DISCUSSION

There is little information on canine trypanosomiasis in Nigeria and its epidemiology is poorly understood. In the study area and its environs, there are no previous prevalence studies making this study a preliminary study. When compared with prevalence obtained in endemic parts of Nigeria, the obtained prevalence of 2.08% in this study could be considered higher and calls for concern as the study area is previously known to be free of trypanosomes. According to other studies, the prevalence of trypanosomiasis in dogs was 3% in Jos Plateau (24), 8.8% in two veterinary clinics in Anambra State (10) and 10% in Nsukka area of Enugu State (11). The detection of *Trypanosoma brucei* trypanosomes in the current study is in agreement with Anene et al. (11); Abenga et al. (12); Omamegbe et al. (10) and Anene et al. (16), who reported that *Trypanosoma brucei* is the predominant species involved in canine trypanosomiasis in Nigeria. The presence of trypanosomes in the study area can be attributed to factors such as the unrestricted movement of dogs through commercial purposes, hunting expeditions into endemic areas and existence of *Glossina palpalis palpalis* both in the wet and dry seasons in areas where hunting expeditions normally take place (17).

Anemia is one of the pathogenic consequences of trypanosomiasis (22). However, the high percentage of the animals showing various levels of anemia may be due to extraneous factors such as the state of nutrition, the presence of other inter-current infections such as helminthes, which is a common problem of developing countries and ubiquitous in livestock and other domestic animals (25) and stress caused by long trekking and distant transportation. From PCV values and FAMACHA® scores, all dogs infected with trypanosomes were anemic except in one dog, with PCV of 36% but a FAMACHA® score of 4. This inconsistency may be as a result of haemoconcentration in the animal (26), or could also indicate recent infection. The leucopenia observed in two of the positive samples (Rikkoto and Unguwar Zuru) could be an indication of early infection (27), but the normal leucocyte counts from the other two positive samples from the Dog market and Filin Jirgi could not be explained.

## CONCLUSION

Findings of this study establish the presence of *Trypanosoma brucei* group in dogs which were found in a free-HAT zone and they pose a risk for human and livestock health. Morphologically, *Trypanosoma brucei brucei* and *Trypanosoma brucei gambiense* are indistinguishable. Therefore molecular testing is suggested in further studies in order to confirm if *Trypanosoma brucei gambiense* is present in the population. Also, appropriate measures which include public health awareness and improvement on veterinary health care delivery services be made more readily available in the study area.

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