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Trypanosome Infections in Tsetse Flies Caught in Selected Areas of Southern Kaduna

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Abstract: Detection of trypanosomes in selected areas of southern Kaduna; Pantaki, Kagarko LGA of Kaduna state was carried out between 2016 - 2017. One hundred and thirty-nine (139) *Glossina palpalis palpalis* and 69 *Glossina tachinoides* were dissected and examined for trypanosome infection using dissection and light examination (Olympus) microscopes. A total of 47 infections (22.6%) out of the 208 flies caught were detected, of which 30 (63.8%) were due to *Trypanosoma vivax* while 17 (36.2%) were *Traypanosoma congolense*. There was higher infection rates 85.1% during the wet compared to the dry 14.9% dry recorded in the dry season. The result revealed a higher prevalence of *T. vivax* infections than *T. congolense* in the tsetse flies caught. Infections detected in both *Glossina* species encountered indicate the important role they play in the epidemiology of African Animal Trypanosomiasis in the area.

Keywords: *Glossina species*, Infection rate, *T. congolence, T. vivax*

INTRODUCTION

Trypanosomes are unicellular protozoan parasites that cause human and animal trypanosomiasis (Hargrove *et al.,* 2012) in Africa (Kneeland *et al.,* 2012; WHO, 2013). The genus *Trypanosoma* contains many different species of significant medical and veterinary importance (Grebaut *et al.,* 2009). Trypanosomes are transmitted to vertebrate host by infected tsetse fly (*Glossina spp.*) which serves as vector during blood meal (*Solano et al.,* 2010).

Trypanosome brucei gambiense and *Trypanosome brucei rhodesiense* infect human causing Human African Trypanosomiasis (HAT) in Africa (WHO, 2006). In animals, *Trypanosome brucei brucei, T. congolense, T. vivax, T. simiae* and T. *evansi* cause African animal Trypanosomiasis (AAT) in livestock and wild animals.

Infection in animal by these trypanosome result in acute or chronic disease that is characterized by intermittent fever, anaemia, occasional diarrhea, loss of appetite, weakness, coma and death if not treated (Fajinmi et al., 2006). Establishing the trypanosome infection rate and species involved is necessary for effective control measures in the area.

MATERIALS AND METHODS

Study Area

Kagarko Local Government Area is geographically within latitude 90 301N and longitude 70 431E covering an area of 1,864km2 with a human apopulation of 240,943 (NPC, 2006). It is located in the Northern Guinea Savannah acharacterized by woodland vegetation. The area has distinct wet and dry seasons from May to October and November to April respectively. The mean annaual rainfall is reported to be 1536mm with temperature peaks in the months of March – April while December – January is acoldest. Human activities in the area include: herding of cattle and crop farming with breeding of sheep, goat and chicken.

Trapping of Tsetse Flies

Tsetse flies were caught for a period of two months each during dry and rainy using biconical traps (Challier and Laveissiere, 1973). Trapping of flies was carried out between July 2016-February 2017.

For each month, seven traps were deployed and set up between 100m and 150m apart for two consecutive trapping days, and harvested daily after 24 and 48 hours to cover the entire activity of the fly. The temperature and relative humidity of each trapping point was also recorded using a whirling hygrometer (Davies, 1977). Flies caught were harvested and transported to Nigeria Institute for Trypanosomiasis Research (NITR), Kaduna in cold box with ice packs for further analysis.

Dissection of Tsetse Flies and Detection of Trypanosomes

In the laboratory, dissection of flies was carried out as described by Davies (1977). Briefly, each fly was immobilized by pressing the thorax and then placed on a microscope slide. The thorax was then fixated with a dissection pin and the head removed using another pin by applying pressure to the head to allow the proboscis to appear completely. For the salivary gland, the side of the abdomen was pinched to tear out the transparent tube shaped salivary glands on each slide. For the midgut, the bottom of the abdomen was cut and pressure was gradually applied to squeeze out the gut. Each organ isolated was then examined under the examination microscope at magnification of 10 then 40. Positive samples with visible trypanosomes under the microscope were identified and recorded, after which it is transferred into a separate tube containing RNA Later and scored at 4^0C for molecular analysis.

Statistical Analysis

Infection rate to tsetse flies with trypanosomes was calculated as the number of infected tsetse flies divided by the total number of tsetse flies caught in a given period multiplied by 100 (Mulugeta *et al.,* 2013).

$$\text{Infection rate (\%)} = \frac{No.of\ infected\ flies}{Total\ No.of\ tsetse\ flies\ caught\ in\ a\ given\ period} \times 100$$

Prevalence of Trypanosome Infection in Tsetse Flies

Forty seven (22.6%) of the 208 tsetse flies caught and dissected during the study were found to be infected with either *Trypanosoma congolense* or *T vivax* representing a total infection rate of 0.226 infections per fly. Forty (85.1%) of the infected flies were caught during the rainy season months, while remaining (14.9%) were caught during the dry season months. Infections rate (0.25) was higher during the rainy season months than the dry season months (0.16). Seventeen (36.2%) of the total infection were due to *Trypanosoma congolense* while thirty (63.8%) were infected by *Trypanosoma vivax.* Significantly ($P<0.05$) higher proportion *Trypanosoma vivax* infections were recorded in flies collected during the wet (80%) and dry (20%) season months and *Trypanosoma congolense* during wet (94.1%) and dry (5.9%) season months (Table 1).

Table 1: Relative Abundance of *Trypanosoma congolense and T. vivax* in each season

Seasons	No. of tsetse flies caught	No. of tsetse infected (%)	Relative Abundance and Percentages (%) of *Trypanosome spp.*	
			T. congolense	*T. vivax*
Rainy	163	40(85.1)	16(94.1)	24(80)
Dry	45	7(14.9)	1(5.9)	6(20)
Total	**208**	**47**	**17**	**30**

DISCUSSION

According to Jordan (1974) and Davies (1977), trypanosome infection rate in a population of tsetse flies may vary according to sex, age, species of trypanosome and tsetse fly species (Okoh *et. al.,* 2012). The high infection rate recorded in female flies sampled in Pantaki therefore could be due to the fact that female tsetse flies may be more exposed to the parasite (trypanosome) infection or probably more susceptible to infection than their male counterparts, female flies could be older.

Infection rate are often highest during the wet season, because files live longer at this time and more chances of becoming infected, whereas infection rates are often lowest in the dry season, possibly because the flies have a shorter survival with fewer chances to be infected and there may be insufficient time for trypanosome development cycle to be completed (Davies, 1977).

The observed preponderance of *Trypanosoma vivax* over *T. congolense* infections has been reported to be due to breakdown in natural protective immunity usually conferred on the host when tsetse fly challenge is high (Godfrey & Killick-Kendrick 1963). This factor could be the probable reason for the high infection by *T. vivax* in flies sampled in the study area. In addition, natural infection by *congolense-type trypanosome* is observed to be generally low with characteristically lower parasite than those of others species including *T. vivax* (Stephen 1986). When parasitaemia is low, the chance of the parasite been picked by the tsetse vector during feeding is low and so are the chances of the parasite to become established in the fly vector (Ahmed 2007).

The recorded frequency of infection in tsetse flies by *Trypanosoma vivax* and *T. congolense* agrees with many authors who carried out a similar study (Owaga, 1981; Clement *et. al.,* 2016).

The two major trypanosomes species were *Trypanosoma vivax* and *T. congolense* both tsetse species are more abundant during wet season than dry season of the years. AAT risks is high.

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