PREVALENCE OF TRYPANOSOMA SPECIES IN SLAUGHTERED CATTLE IN JOS ABATTOIR, PLATEAU STATE, NIGERIA

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Abstract
The survey of bovine Trypanosomiasis was carried out between March and June 2014 in Jos main Abattoir, Plateau State Nigeria. A total of two hundred (200) blood samples were collected from two breeds of cattle (Sokoto Red and while Fulani) at the point of slaughter. Analysis of animal Trypanosomiasis was done using Standard Trypanosome Detection Method (STDM). Out of the 200 blood samples collected, 9(4.5%) were positive for *trypanosome* species (*Trypanosoma congolense* 2.0%, *T. vivax* 1.5% and *T. brucei* 1.0%). The study showed that bulls cattle recorded *trypanosome* infection rate of 7.5% are more prone to infection than the females which recorded 3.2% infection rate. The infected cattle (9) were all adults, whereas the calves cattle did not record any *trypanosome* infection. All the infected cattle belong to the white Fulani breed of cattle. The Sokoto red breed of cattle did not record any trypanosome infection. There was a significant different ($p<0.05$) between the packed Cell Volume (PCV) of the infected cattle compared to non-infected. Other haemoparasites recorded among the cattle are *Babesia bijemina* 3(1.5%) and *B.bovis* 4(2.0%), the study showed that animal Trypanosomiasis is still prevalent among the cattle slaughtered in the Jos main Abattoir.
Key words: **Prevalence, Trypanosoma, Cattle, Jos, Abattoir.**

Introduction

Background information

African animal trypanosomiasis is a debilitating disease of man and animal. It is caused by haemoflagelate of genus: *Trypanosoma* family Trypanosomatidaetransmitte by tsetse flies (Glossina) (Battieau *et al.,* 2011; Banomi *et al*., 2011; Melachio *et al.,* 2011, WHO, 1998). It is characterized by parasitaemia, fever, anemia, loss of weight, reduced productivity and frequently high mortability which among other factors limit the pace of rural development in tropical Africa (Swallow, 2000; Abenga *et al.,* 2002; Fajinmi *et al.*, 2007). It is estimated that about 60 million people and 48 million cattle (Kristjanson *et al*., 1999: Samdi *et al*., 2010) are at risk of contracting African trypanosomiasis from the 23 species and 33 sub-species of tsetse flies infesting 10 million km^2 of Africa stretching across 40 countries. Animal trypanosomiasis still constitute a major threat to food security in several parts of sub-Saharan Africa (Swalow, 2000). The current threat if African animal trypanosomiasis ranked among the ten top cattle disease on sustainable livestock production and mixed farming, coupled with failure of vector control as well as chemotherapy/chemoprophylaxis to control the present resurgence of the disease, present a major constraint in the development of the African continent (Abenga *et al*., 2002; Perry et al., 2002; Samdi *et al*., 2010, Kone *et al*., 2011). Animal trypanosomiasis has been known to cause not less than 3 million livestock deaths each year, 20% less in calving, 25% reduction in milk yields, 50% reduction in livestock numberws (PAAT, 2000). The loss in livestock production and mixed agriculture alone is valued at 5 billion US dollars yearly in Africa, however effective and sustainable control measure can result in up to three fold increases in the current estimated livestock population in Nigeria (Onyiah, 1997).

Cattle are the most common types of large domesticated animals of sub-family bovinae and most widely spread group of the Bos. They are commonly classified collectively as baspringinenius which are raised for meat (beef), as dairy animals for the production of milk and other dairy products. Cattle are also used as draft animals (pulling of carts and ploughs) and for other products such as leather and dung. The trypanosome species of economic importance in cattle are *Trypanosoma congolense*, *T. vivax* and *T. brucei*.

Animal trypanosomiasis has been ravaging several parts of the pattern of tsetse fly spread covering about 80% of the land mass between latitude 4^0N and 13^0N.

Jos, Mambilla and Obudu highlands which had been hitherto declared tsetse and trypanosomiasis free zones are now infested (Onyiah et al., 2005). Global warming has been implicated in this situation.
The decrease in national and international funding for research and surveillance of trpanosomiasis has resulted in insufficient information on the current status of the disease (Maikaje *et al*., 2008).

The aim of this study is to identify the species of trypanosomes in the study area. Sustained surveillance of trypanosomiasis in cattle is as important prerequisite for the enhancement of livestock production in Nigeria. The present effort to expand the animal industry in the country requires the knowledge of the disease problems that could be prevented and controlled. It will therefore be beneficial if the prevalence of trypanosomiasis in cattle is investigated periodically. The study in abattoir is good for this because it is converging place for states and across the international border of Republic of Niger and Republic of Chad and occasionally from other West African States. Apart from revealing the prevalence of the disease, the outcome of the study will help in making categorical statement on the dangers of allowing dogs and cats to eat the flesh and bones of cattle slaughtered in abattoirs. This is because they can be infected with trypanosomes by oral ingestion of cattle slaughtered in abattoir. This will reduce the transmission of the disease if checked.
African trypanosomiasis is a severe parasite disease that affects both human and livestock (Chamond et al., 2010; Adams et al., 2010).

Study Area
The study was carried out between March to June 2014 at the Jos Abattoir in Jos North Local Government Area (LGA) of Plateau State Nigeria. Plateau derives its name from the landscape that predominates in this part of the country, which is often refered to as the "Jos – Plateau". It is formed on the basement complex of rock, which has produced the characteristic iceberg landscape. The Plateau highland stands at an average height of 1200 metres above sea level. The highland is slightly undulating and rises from the escarpment of the riverside plains of the River Benue. Jos Plateau is located in the North East area of North Central Nigeria. It lies between latitude 9.55^0N and longitude 8^0E of Greenwich Meridian.
The landscape is guinea savanna; mostly rocky, but with chains of hills and many captivating rock formations. It has a semi-temperate weather condition, which is greatly influenced by the strategic location on the Plateau. This makes Jos climate a bit similar to the temperate climate in Europe and America. Temperature ranges from a maximum of 29^0C to 30^0C to a minimum of 110C, with an annual rainfall of about 15cm, the rains lasting between six and seven months. The months of December through February are particularly cold due to the dry harmattan winds. This peculiar climate has endeared it to people of different ethno-geographical cultures, and this makes the population of Jos and its environs an assemblage of a good representative sample of Nigeria and European population (Bingel, 1978, Isichei, 1982). Plateau State has over fifty ethnic groups, with no single group large enough to claim majority position. Some of these ethnic groups include Berom, Ngas, Tarok, Jarawa (Afizere), Ganawuri, Irigwe, Amo, Rukuba, Anaguta, Pemgana, to mention just a few. These ethnic groups are known for their different belief systems, and cultural festivals. Tin mining which used to predominate the economic activities of this area, is now giving way to subsitence agriculture. Due to its climate, crops such as Irish potatoes, millet, guinea corn, maize, beans, wheat and groundnut are produced. These cereal and food crops form the major source of food for the inhabitants of the area. The savanna region favours animal husbandry. Hence, both farmers and many civil servant practice favours animals husbandry. Hence, both farmers and many civil servant practice livestock farming. Livestock live within the households in most indigenous houses practicing livestock farming (PADP, 2000).
Jos main abattoir is located in Jos South Local Government Area (LGA) between latitude 90 and 460N and longitude 80 and 510E. it has an annual rainfall of 1300-1500mm (April – October) and 1250m above sea level. It is bounded by Jos North vegetation in latitude. It enjoys mountain type climate like any other part of Jos. Jos main Abattoir is the converging slaughter house for animal to be sampled randomly.

Investigative Question and Sample collection/sample size
Questions on age, sex, and source of the animal were posed to the people at the abattoir.
Two hundred (200) cattle of different breed's sexes and ages were selected randomly. They were examined physically at ante-mortem for any clinical manifestation of trypanosmiasis (emaciation, enlarge lymph node, parlour of mucous membrane, pulsation of jugular vein).

Method of Collection
Five (5) millitres (ml) of blood sample were collected at the slaughter point from two hundred (200) animals of both sexes into Ethylene Diamine Tetra Acetic Acid (EDTA) bottles. The blood sample were collected from cattle as soon as they were slaughtered when blood was coming out in trickles. The bottles were properly labelled, firmly closely and was mixed through rocking to allow the EDTA mixed properly with the blood. The sample bottles containing the blood were maintained in ice-packs immediately and then transported to the Nigerian Institute for Trypanosomiasis Research (NITR), Vom for analysis. Each sample collected was

indentified or labelled according to serial of animals, cattle breed, age bracket and sex.

Method of sample analysis

Diagnosis of animal trypanosomiasis was carried out using standard trypanosomiasis detection Method (STDM) – wet, thin and thick films (Wilson, 1969) and concentration method (Woo and Kobayashi, 1975). Parasite species were identified using Giemsa staining technique and observed using oil immersion objective (x100 magnification). Grease free glass slides were used to prepare blood smears and thin films were fixed methanol. The films were left for about 45 minutes. Buffered distilled water was used to differentiate the slides. The slides were allowed to air dry and were examined under the microscope. Buffy coat technique is the same as in the HCT except that after centrifugation the buffy coat/plasma junction is cut and the buffy coat is smeared on clean grease free slide in such a way as to be includes the uppermost layer or erythrocytes and some plasma. The smear was also examined under x 100 objective. According to FAO (2000), the buffy coat technique is a relatively sensitive method.

Packed cell volume (PCV)

Packed cell volume was estimated by filling capillary tubes to about ¾ of their lengths with blood samples. The tubes were sealed at one end with cristaseal and placed in a Microhaematocrit centrifuge with the sealed ends outermost. The tubes were then centrifuged at a predetermined speed for 5 minutes. The PCV was estimated using a PCV reader.

Statistical Analysis

The data obtained from this study were analysed using simple percentage.

Result

A total of 200 blood samples were collected from two breeds of cattle (Sokoto Red and white Fulani) from the study area.

In table 1 below, the prevalent rate of 4.50% was recorded, made up of *T. congolense* 4(2.00%), followed by *T.vivax* 3(1.50%), and the least was observed with *T. brucei* 2(1.00%).

Table 1: The prevalence of *Trypanosoma* species in slaughtered cattle in Jos Abattoir

Number of samples Collected	Parasites	Number Positive	Percentage (%)
200	*T.vivax*	3	1.5
	T.congolense	4	2.0
	T.bruccei	2	1.0
Total		**9**	**4.5**

Table 2: The prevalence of Trypanosoma species in cattle slaughtered in Jos abattoir in relation to sex

Parasites	Bulls(66)		Female (134)	
	Number + ve	% +ve	Number +ve	%+ve
T.vivax	3	4.50	0	0
T. congolense	2	3.00	2	1.60
T.brucei	0	0.00	2	1.60
Total	**5**	**7.50**	**4**	**3.20**

In table 2 above, the Bulls cattle 3(4.50%) were infected with T. vivax followed by *T. congolense* 2(3.00%), and none was infected *T. brucei*. Also in Table 2 above, the female cattle 2 (1.60%) were infected with *T.congolense*, *T.brucei* 2(1.60%), and none was infected with *T.vivax.*

Table 3: The prevalence of Trypanosoma species in cattle slaughtered in Jos abattoir in relation to age

Parasites	Adult (n=129) Number+ve	%+ve	young (n=71) %+ve
T.vivax	3	2.0	0
T.congolense	4	5.0	0
T.brucei	2	1.6	0
Total	**9**	**8.6**	**0**

Table 3 above shows the infection rate in relation to age. The adult cattle were more prone to trypanosome infection, 4(5.0%) adult cattle recorded *T. congolense*, followed by *T. vivax* which recorded 3(2.0%) and the least was observed with *T. brucei* which recorded which recorded 2(1.6%). There was no record of any trypanosome infection in the young cattle.

Table 4: The Prevalence of Trypanosoma Species in Cattle Slaughtered in Jos Abattoir in relation to breeds

Breed	Number examined	Number + ve	%infection rate
White Fulani	189	9	5
Sokoto Red	11	0	0
TOTAL	200	9	5

In Table 4 above, the Sokoto Red breed of cattle screened apparently look healthy with no trypanosomes observed in their blood, while the White Fulani breed of cattle had 9(5.0%) positive cases of trypanosomes.

Table 5: Mean Packed cell Volume (PCV) of infected cattle to non-infected cattle.

Breed	Infected cattle	Pcv	non-infected cattle		normal pcv
White Fulani	9	21.60	180	33.71	33-47
Sokoto Red	0	-	11	35.50	
Total	**9**		**191**		

The Packed Cell volume of the cattle is represented in Table 5 above.

The nine White Fulani cattle which were infected with *Trypanosome* had a mean PCV of 21.60, while the one hundred White Fulani cattle which were not infected had a mean PCV of 33.71, the eleven non-infected Sokoto Red breed of cattle had a mean PCV of 35.50.

Table 6: identification of other heamoparasites present in the slaughtered cattle

Parasites	No examined	No positive	%infection rate
Babesia bigemina	200	3	1.50
Babesia bovis		4	2.00

Total	**200**	**7**	**3.5**

Table 6 above shows other heamoparasites observed in the cattle under investigation, we noted 3(1.50%) cattle had *Babesia bigemina*, and 4(2.00%) cattle had *Babesia bovis*, given a total prevalence rate of 3.50%.

Table 7: mixed trypanosome infection in cattle slaughtered in Jos abattoir

Mixed species	Number examined	Number positive %	infection rate
T.vivax + *T.congolensse*	200	2	1.0
T.brucei + *T.congolense*		2	1.0
Total	**200**	**4**	**2.0**

Table 7 above shows the mixed trypanosome infection recorded in the course of the study, where a combination of *T.brucei* and *T. congolense* was recorded in 2(1.0%) cattle. Also a combination of *T.vivax* and *T.congolense* was recorded in 2(1.0%) cattle given a total prevalence of (2.0%).

Discussion Conclusion and Recommendation

The importance of cattle in the economy of Nigeria cannot be over emphasized. Apart from milk, cattle provides up to 50% of meat supply. The effect of trypanosome infection on cattle range from anaemia, immunosuppression retarded growth, low milk production, still birth, and depressed reproductive performance (Omatainse et al., 2000).

The result of this study indicates that *Trypanosoma vivax, Trypanosoma congolense* and *Trypanosma brucei* were prevalent. An overall infection rate of 9(4.5%) was observed as shown in Table 1. This overall infection rate of 4.5% is close to the national prevalence rate in cattle obtained by the European Economic Commission. Trypanosomiasis Control between 1989 and 1991 (Onyiah, 1997). Abenga *et al* (2002) reported similar infection rates in cattle at slaughter in Kaduna, these rates indicate a general resurgence in the menace of trypanomiasis in Nigeria with negative economic impact on meat quality of animals at slaughter. Surveys conducted between 1989 and 1991 in northern Nigeria where two-thirds of Nigeria's livestock resources are concentrated showed a prevalence rate of 4.3% in cattle. A higher prevalence rate of 10.0% was obtained in a wider survey of all agro-ecological zones between 1993 and 1996 (EEC Mid-Term Report, 1992; NITR/NARP external review, 1996; Onyiah, 1997). More recent studies in the region have revealed prevalence ranging from 5.5% to 17.8% to over 50% (Qadeer *et al*, 2009).

The relatively lower prevalence (4.5%) recorded in the present study compared to the figures 5.5% to 17% to over 50% reported by (Qadeer *et al*., 2009) may be ascribed to possible treatment of the cattle by herd owners before slaughter. Another reason might be that most of the cattle slaughtered at the Jos abattoir were transported from Jigawa, Yobe and Bauchi State, thereby reducing possible animal fly contact in transit. Low infection rate or absence of infection in some States in the far northern part of Nigeria might be attributed to decrease in both tsetse and other bitting flies' population as a result of environment, climatic and anthropological changes.

The results of this signify that animal trypanosomiasis is still an important constraint in livestock production and productivity. The mixed trypanosome infection (Tables 7) recorded in this study is important. Simultaneous infection with more than one trypanosome species is common (Malele *et al*., 2011; Laohasinnarong *et at*., 2011). The reason for mixed trypanosome has been attributed to tsetse flies being infected by mixed stains of trypanosomes (Kubi et al., 2005; Malele *et al*., 2011). Mixed trypanosome infection could also be due to mechanical transmission of trypanosomes by other biting flies. Mechanical transimission of trypanosomes by other vectors other than Glossina has been identified as a factor responsible for the spread of the parasite to many parts of the world and maintenance of transmission in the presence of tsetse control (Davila and Silva, 2001; Samdi *et al*., 2010).

The dominance of *Trypanosoma vivax* in this study is of significance. Several workers in Northern Nigeria have pointed out the importance of *T.vivax* infection. Ahmed *et al*., (1994) recorded a rate of 7.3%. Nine (9) out of 11 positive cases were infected with *T.vivax*. Similarly, Abenga *et al*., (2002) reported that T.vivax has the highest infection rate. The reason for a higher prevalence rate of *T.vivax* could be ascribed to the mechanical transmission or the shorter development cycle (10 days) in the anterior station of the tsetse fly (Abenga *et al*., 2002). Ogunsami et al. (2000) also reported of the 206 cattle sampled in Plateau State 20 (7.71%) were positive, with *T.vivax* having the highest infection rate of 61.11% followed by *T.congolense* with infection rate of 22.2%.

This study supports the findings of Samdi et al. (2008) who recorded *T. congolense* as a predominant trypanosome species. *T congolense* and *T.vivax* have been reported to be transmitted mechanically by African

tabanid. (Desquesnes and Dia, 2003; 2004, Onyiah, 2004).

T. brucei had the least infection rate in this study. Abenga et al. (2002) recorded a similar result. The reason for the very low infection rate of *T.brucei* could be due to the fact that this particular species requires a longer time to obtain full development in the tsetse fly compared to *T.vivax* and T.congolense *T. brucei* infection might be of zoonotic importance since domestic animals are known reservoirs of *Trypanosoma bruce igambiense*, a human infective *trypanosome* in West Africa (Omotainse *et al*., 2000).

This study reveals that bull cattle are more prone to trypanosome infection (7.5% infection rate) than the females (3.2% infection rate) as shown in table 2. This may be due to the fact that, the males lead the herd, thereby exposing them more to tsetsefly bites, there is a rise in the infection as the cattle advanced in age. Thus the adult sampled in the study had a prevalence rate of 9(8.6%) as against the young ones who recorded 0.0% prevalence rate (Table 3). This agrees with previous findings of (Kalu, 1995) who reported a 5.79%. 9.64% positive in bulls was reported in Kudara Local Government Area of Kaduna State but none in calves. The high prevalence of trypanosome species in adult compared to young ones may be due to reduced immunity and higher extent of exposure to tsetse bites among the adults.

The prevalence of trypanosome species in relation to breed showed that Sokoto Red recorded 0% infection rate as against white Fulani cattle (5.0%) as recorded in Table 4. This shows that the white Fulani breed of cattle slaughtered at the Jos abattoir were more susceptible to trypanosomiasis relative to the Sokoto Red breed. Njoku (2006) also recorded a similar incidence. The Sokoto red breeds are a group of rugged animals and are used as work bulls.

The packed cell volume (PCV) is the most reliable indicator of anaemia in trypanosomiasis (Murray, 1978; Ranjithkumar *et al*., 2011). The mean PCV of the infected cattle in this study is as recorded in Table 5. The low PCV values of the infected cattle are due to trypanosomiasis induced anaemia. Apart from trypanosomes, other parasites recorded were *Babesia bijemina* (3 cattle) and *B. bovis* (4 cattle). However, these parasites were not recorded in the trypanosome infected cattle.

Conclusion

From the study conducted, it was observed that trypanosomiasis is a prevalent disease among cattle slaughtered in the Jos abattoir. Result obtained showed that white Fulani cattle are more prone to trypanosome infection than the Sokoto Red breed. The infections recorded are cyclical and mechanical transmissions. Trypanosomiasis disease is more prevalent in the adult cattle. These groups of cattle are greatly exposed to infection due to the nomadic method of husbandry and their frequent contact with tsetse flies at watering places. Trypanosomiasis disease is more prevalent in the adult cattle. These groups of cattle are greatly exposed to infection due to nomadic method of husbandry and their frequent contact with tsetse flies at watering places. Trypanosomiasis is a great treat to livestock development in Africa. Since no country in Africa exists in isolation and tsetse flies cover distance across the international borders, within the sub-Saharan Africa. The Nigeria government as a matter of urgency gives more funding to the relevant agencies such as the Nigeria Institute for Trypanosomiasis Research(NITR) given the national mandate to conduct research and development in the area of trypanosomiasis.This will enable research scientists explain the epidemiology of both tsetse and trypanosomiasis and then carryout programmes of control. The Biological insect Control of Tsetse (BICOT) has proven to be successful and should be encouraged by government.

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