

## Epidemiological survey of haemoparasitic infection in trade cattle at slaughter in Lafenwa abattoir, Ogun State, Nigeria

Okwelum N.<sup>1,2\*</sup>, Iposu S.O.<sup>2</sup>, Sowande O.S.<sup>2</sup>, Smith O.F.<sup>2</sup> and Takeet M.I.<sup>3</sup>

<sup>1</sup>Institute of Food Security, Environmental Resources and Agricultural Research, Federal University of Agriculture, Abeokuta, Nigeria. <sup>2</sup>College of Animal Science and Livestock Production, Federal University of Agriculture, Abeokuta, Nigeria. <sup>3</sup>College of Veterinary Medicine, Federal University of Agriculture, Abeokuta, Nigeria.



\*Corresponding Author: E-mail [drjhephzi@yahoo.com](mailto:drjhephzi@yahoo.com)

### Abstract

*An epidemiological survey of haemoparasitic infection in trade cattle was carried out at Lafenwa abattoir, Abeokuta, from August to November 2008. Thin Blood film and Haematocrit Centrifugation Techniques were used to detect haemoparasites. A total of 452 cattle that comprised 174 cows and 278 bulls were examined. The breeds included 78 'Red Bororo', 14 'Sokoto Gudali' and 360 'White Fulani'. Packed cell volume (PCV), red blood cell (RBC) count, haemoglobin concentration (Hb), total white blood cell (WBC) count and differential counts of WBC, mean corpuscular volume (MCV) and mean corpuscular haemoglobin (MCH) were measured. Data were subjected to analysis of variance using Genstat statistical software, with sex and breed and blood parasite species detected as factors. Results showed that 22% of the cattle were infected with haemoparasites while 78% were parasite-free. The parasites were Trypanosoma congolense (4%), Anaplasma centrale (2%), Babesia bovis (14%), A. centrale + B. bovis (1%) and Babesia divergens (1%). Parasite species identified significantly influenced ( $P < 0.001$ ) the PCV, RBC, and Hb concentration. The prevalence rates observed is considered to be of epidemiological and economic importance because infected animals might be sources of infection to other healthy herds in the area.*

**Key words:** prevalence, haemoparasites, trade cattle, slaughter, abattoir, Abeokuta

### Introduction

Diseases of farm animals militate against the expansion of livestock production and could be costly in term of death, reduced performance and curative treatment. For example, diseases such as tick-borne diseases, anaplasmosis and babesiosis cost a total loss of about US\$170 million per annum according to Bourdin (1980) and ILRI (1995).

Haemoparasitic diseases are considered as the most important constraints to the health and improved productivity of cattle in sub-Saharan Africa (FAO, 1984; Bell-Sakyi *et al.*, 2004). Haemoparasites cause serious health problem and a severe constraint to

Africa's socio-economic development, which every year claims the lives of over 50,000 people and kills more than 3 million livestock, causing huge economic losses and untold human misery (John, 2004). Haemoparasitic diseases are characterized by parasitaemia, pyrexia, anemia, generalised lymphadenopathy, loss of condition, reduced productivity and frequently high mortality (Abenga *et al.*, 2002; Fajinmi *et al.*, 2007). Other symptoms include hepatomegally, splenomegally and immunosuppression with reduced host resistance to secondary infections (Darji *et al.*, 1992). Because of losses in production from death and

pathologies in animals; and the abundance of vectors of the haemoparasitic diseases, continuous surveillance is very necessary to monitor the effectiveness of control measures and also provide epidemiological data for future monitoring and control of the disease. Reports in some other parts of Nigeria had revealed the epidemiological importance of such studies (Ahmed and Agbede, 1993; Daniel *et al.*, 1994; Kalejaiye *et al.*, 1995; Kalu *et al.*, 1996; Nawathe *et al.*, 1995). An average of 120 cattle are slaughtered daily in Lafenwa Abattoir, providing beef for the residents of Abeokuta metropolis, its environs and some parts of Lagos State. The aim of this study was to determine the prevalence of haemoparasitic infections in trade cattle at slaughter in Lafenwa abattoir, Ogun State, Nigeria.

#### **Materials and Methods**

*Description of study area and cattle sampled:* The study was carried out in Lafenwa abattoir, Abeokuta North Local Government area, Ogun State in South-west Nigeria, situated at 7°9'39" N, 3°20'54" W within the rainforest vegetation. Most of the animals slaughtered in the abattoir were originally raised in various parts of northern Nigeria. The cattle were predominantly crosses of White Fulani, Sokoto Gudali and Red Bororo breeds. However, sampled animals were classified based on physical observation of predominant phenotypic traits of pure breeds in the mixed-bred cattle population.

*Study Design and Sampling:* A total of four hundred and fifty two (452) blood samples were collected at random from cattle at slaughter. The sex and breed of the cattle were recorded and five millilitres (5ml) of blood was collected into labelled specimen bottles that contained Ethylene Diamine Tetraacetic Acid (EDTA; 1mg/ml of blood)

as anticoagulant. Samples were immediately conveyed in a cold box to the Parasitology Laboratory for processing and examination in the College of Veterinary Medicine, Federal University of Agriculture, Abeokuta.

***Examination of the Samples for Blood Parasites:*** The blood samples were processed and examined using thin blood smear method and micro-haematocrit centrifugation technique (Woo, 1970) for detecting the presence of blood parasites. Isolates were identified based on morphological and biometrical data, according to Hoare (1972).

*Thin Blood Smear:* Thin blood smear was made by spreading a drop of blood on the slide forming single cell layer. This was air-dried, labelled and fixed in methanol for 3-5 minutes. This was followed by staining in 10% Giemsa for 20-30 minutes, rinsing in physiological buffered solution and air-drying before examining for blood parasites under x100 (oil immersion) microscope.

*Packed Cell Volume (PCV):* Packed cell volume (PCV) was determined using a Micro-Haematocrit Centrifuge. The blood was drawn into capillary tubes, one for each sample, and spun for 3 minutes at 3000 revolution per minute (rpm). The packed cell volume was read in percentage using a PCV Reader.

*Haematocrit Centrifugation Technique (HCT):* The centrifuged blood in the capillary tubes described above was placed on a clean slide and held together using immersion oil at the junction of red cells and Buffy coat was observed under x10 and x40 microscope for the presence of trypanosomes in the buffy coat, as described by Woo (1970).

*Blood Cell Count:* The red blood cell (RBC) and total white blood cell counts were obtained using Neubauer Chamber. The differential blood counts were determined

as proportion of different types of leucocytes (WBC) on the blood smear and were expressed in percentages.

**Haematimetric Indices:** Haematimetric indices were calculated from determined PCV, RBC, and Hb concentration, according to Jain (1986). These included: Mean Corpuscular Volume (MCV) and Mean Corpuscular Haemoglobin (MCH).

**Statistical Analyses:** Animals were grouped according to the parasite species found in their blood and expressed as percentages of the total to show the prevalence rate for each parasite species. Prevalence rates were expressed in a pie-chart. Groups were then subjected to Analysis of Variance (ANOVA) as unbalanced design using the Genstat statistical package (GenStat Release 7.2 DE, Copyright 2007, Lawes Agricultural Trust, Rothamsted Experimental Station). Sex and 'breed' of animals were considered in a two-way ANOVA while parasite species found was considered in a one-way ANOVA. Parameters in percentage (i.e. PCV and the differential counts of WBC) were subjected to angular transformation before ANOVA to correct for non-normality; however, tabulated means ( $\pm$ standard error of means) were derived from raw values, as measured. Means that were statistically different were further expressed in bar charts to show the trend graphically.

## Results

Table 1 shows the prevalence rate of haemoparasites in the study area. Animals with no haemoparasites accounted for 78% while 22% were infected with one haemoparasite or the other, while there were mixed infections in some of the animals. Haemoparasite species identified and their level of prevalence were: *Anaplasma centrale* (2%), *Babesia bovis* (14%), *A. centrale* and *B. bovis* combined

(1%), and *B. divergens* (1%). *Trypanosoma congolense* (4%). This prevalence was represented descriptively in a bar chart in Figure 1 showing the relative percentage of each Haemoparasite.

Also from Table 1, sexes and breeds of cattle sampled were expressed as percentages of species cases. Thus, a third of all *Anaplasma centrale* cases were bulls (33%) while *Trypanosoma congolense* cases were almost equally distributed between the sexes (45 vs. 55% of bull and cows, respectively). Similarly, prevalence of Trypanosome-infection among the breeds was as follows: Red Bororo (20%; 4 animals), Sokoto Gudali (5%; 1 animal), and White Fulani (75%; 15 animals). All the *Babesia divergens* and *A. centrale* + *B. Bovis* cases were found in the White Fulani breed.

Table 2 shows the haematological indices of the animals in respect of sex and breed of cattle. The parameters measured were similar for both sexes and all the 'breeds' of cattle ( $P < 0.05$ ). There was no interaction ( $P < 0.05$ ) of sex and breed on the parameters measured either. The haematological indices are presented in Table 3. The PCV ( $P < 0.001$ ), RBC ( $P < 0.001$ ), and Hb concentration ( $P < 0.001$ ) differed according to the parasite species (cases). The effect of haemoparasitic infection on PCV is presented in Figure 2, animals with no blood parasite had the highest PCV value of 33%, followed by *Anaplasma centrale*-infected animals. Haemoparasite infected animals had significantly lower PCV value compared to parasite-free animals (20% vs. 33%). Animals with mixed infection of *A. centrale* and *Babesia bovis* had the lowest PCV of 19%. Figures 3 and 4 presents the effects of haemoparasites on RBC and Hb concentration. The same trend was shown for RBC and Hb concentration,

*Survey of haemoparasitic infection in trade cattle at slaughter*

**Table 1: Prevalence of Haemoparasites (N; % in parenthesis) among the Sexes and Breeds of Trade Cattle**

Haemoparasites	Total Prevalence *	Sex X Prevalence**		Breed X Prevalence**		
		Bulls	Cows	Red Bororo	Sokoto Gudali	White Fulani
<i>Anaplasma centrale</i>	9 (2%)	3 (33%)	6 (67%)	0 (0%)	2 (22%)	7 (78%)
<i>Babesia bovis</i>	63 (14%)	37 (59%)	26 (41%)	11 (17%)	1 (2%)	51 (81%)
<i>A. centrale</i> + <i>B. Bovis</i>	3 (1%)	3 (100%)	0 (0%)	0 (0%)	0 (0%)	3 (100%)
<i>Babesia divergens</i>	5 (1%)	2 (40%)	3 (60%)	0 (0%)	0 (0%)	5 (100%)
<i>Trypanosoma congolense</i>	20 (4%)	9 (45%)	11 (55%)	4 (20%)	1 (5%)	15 (75%)
Parasite-free	352 (78%)	223 (63%)	129 (37%)	64 (18%)	10 (3%)	278 (79%)

N – Number of cases

\*percentage of Total Animals Sampled

\*\*Percentage of Haemoparasite species cases

**Table 2: Haematological indices (±SE; ranges in parenthesis) of trade cattle in according to sex and breed of cattle**

†Sex	N	PCV (%)	RBC (X 10 <sup>12</sup> /L)	WBC (X 10 <sup>9</sup> /L)	Hb (g/dl)	MCV (fl)	MCH (pg)
Female	174	31±0.5 (10-51)	6±0.3 (3-10)	6±0.1 (3-9)	10.4±0.17 (3.3-17.0)	5.1±0.06 (0.5-7.6)	1.7±0.02 (0.2-2.5)
Male	278	31±0.4 (12-47)	6±0.1 (3-9)	6±0.2 (3-9)	10.3±0.12 (4.0-15.7)	5.2±0.04 (3.6-7.6)	1.7±0.01 (1.2-2.5)
<b>*†Breed</b>							
Red Bororo	78	32±0.6 (17-45)	6±0.1 (3-9)	6±0.1 (4-9)	10.7±0.21 (5.7-15.0)	5.2±0.06 (4.1-6.9)	1.7±0.10 (1.4-2.3)
Sokoto Gudali	14	30±1.5 (18-38)	6±0.3 (4-7)	6±0.2 (4-7)	10.3±0.50 (6.0-12.7)	5.2±0.15 (4.3-6.2)	1.7±0.05 (1.4-2.1)
White Fulani	360	30±0.3 (10-51)	6±0.1 (3-10)	6±0.2 (3-9)	10.3±0.12 (3.3-17.0)	5.1±0.04 (0.5-7.6)	1.7±0.01 (0.2-2.5)

\*Breed classification was based on physical observation of predominant phenotypic traits of pure breeds in the mixed-bred cattle population

† No significant main or interaction effect of sex or breed of cattle on all parameters (P > 0.05)

**Table 3: Haematological indices (±SE; ranges in parenthesis) of Trade Cattle as Affected by parasite species**

Parasite Species	N	PCV (%)*	RBC* (X 10 <sup>12</sup> /L)	WBC (X 10 <sup>9</sup> /L)	Hb (g/dl)*	MCV (fl)	MCH (pg)
<i>Anaplasma centrale</i>	9	31±2.5 (22-45)	6±0.4 (4-8)	6±0.3 (4-7)	10.3±0.83 (7.3-15.0)	5.1±0.19 (4.4-5.8)	1.7±0.06 (1.5-1.9)
<i>Babesia bovis</i>	63	27±0.7 (12-45)	5±0.1 (3-9)	7±0.8 (4-9)	9.0±0.23 (4.0-15.0)	5.2±0.1 (3.9-7.1)	1.7±0.03 (1.3-2.4)
<i>A. centrale</i> + <i>B. Bovis</i>	3	19±2.9 (14-24)	4±0.7 (3-5)	5±0.7 (4-6)	6.3±0.96 (4.7-8.0)	4.7±0.35 (4.2-5.4)	1.6±0.12 (1.4-1.8)
<i>Babesia divergens</i>	5	26±2.8 (20-33)	5±0.4 (4-6)	6±0.3 (6-7)	8.8±0.94 (6.7-11.0)	5.2±0.42 (4.2-6.4)	1.7±0.14 (1.4-2.1)
<i>Trypanosoma congolense</i>	20	20±1.3 (10-29)	4±0.3 (3-6)	5±0.3 (3-8)	6.7±0.45 (3.3-9.7)	4.8±0.12 (3.9-5.8)	1.6±0.04 (1.3-1.9)
Parasite-free	352	33±0.3 (15-51)	7±0.1 (4-10)	6±0.1 (3-9)	10.8±0.10 (5.0-17.0)	5.2±0.04 (0.5-7.6)	1.7±0.01 (0.2-2.5)

\*-significant at P < 0.001

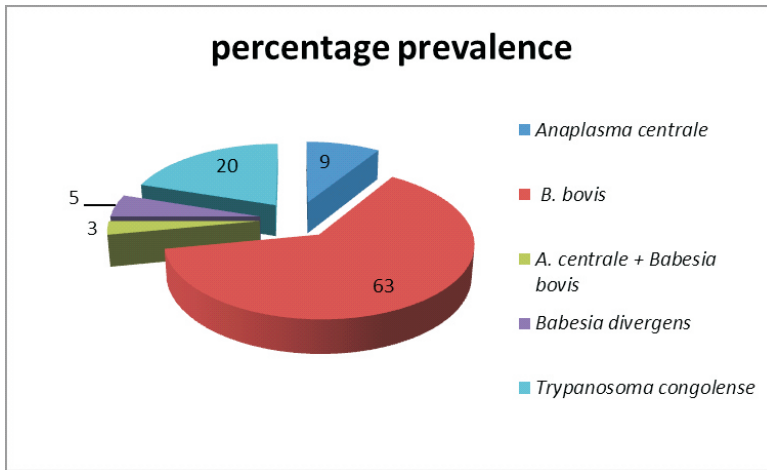


Figure 1: Percentage of Haemoparasite Infection According to Parasite Species

respectively.

**Discussion**

Overall prevalence in this study was 22% which is similar to the 25% reported by

Kamani *et al.* (2010) and also *Babesia bigemina* and *B.bovis* accounted for 16.0% which is similar to the prevalence rates in this studies, *Trypanosoma spp* (2.8%) and *Anaplasma species* (1.9%) was similar to

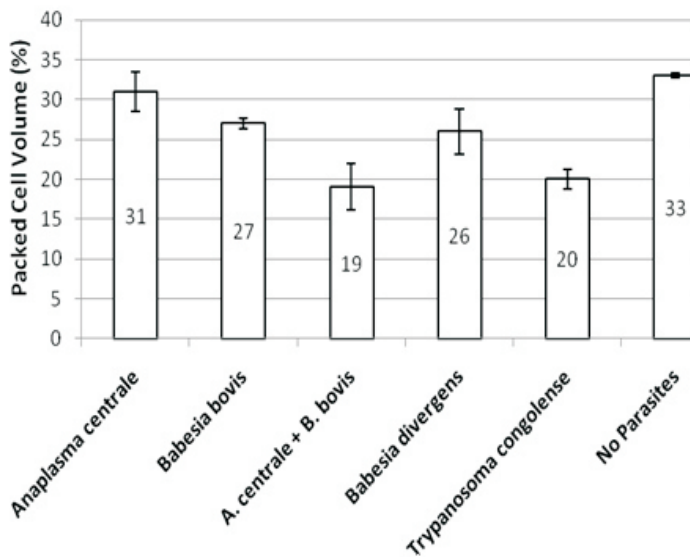


Figure 2: Effect of Haemoparasitic Infection on PCV (%) of trade cattle.

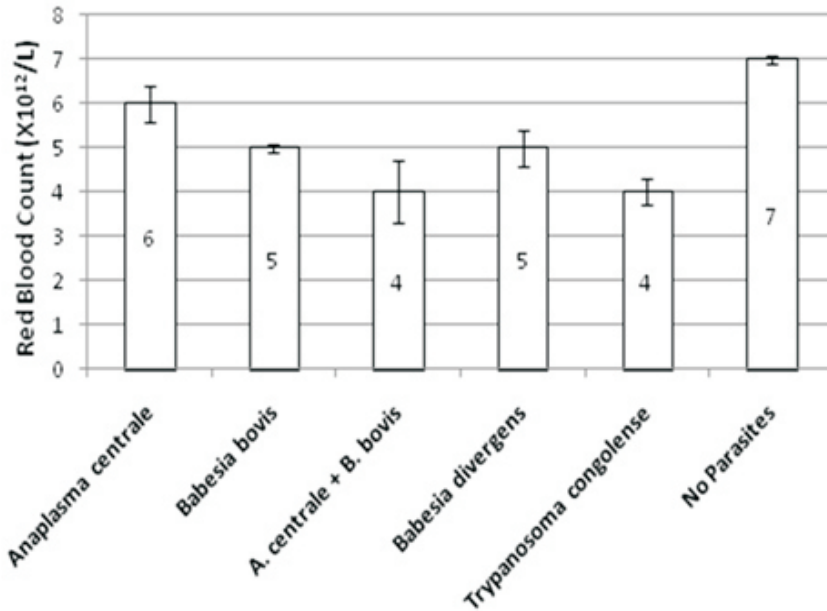


Figure 3: Effect of Haemoparasitic Infection on RBC (x 10<sup>12</sup>/L) of trade cattle

the results in this present study which were 4% and 3% respectively. The haemoparasites identified alone or in combination with others had a significant (P<0.05) effect on the mean PCV and haemoglobin concentration of infected animals which is similar to the reports of Kamani *et al.* (2010) with the infected animals having a lower mean PCV and Haemoglobin concentrations as compared to the non-infected animals. The prevalence rates of *Babesia species* (16%), *Anaplasma species* (3%), *Trypanosoma congolense* (4%) is very low compared to the reports of Farougou *et al.* (2007) which were; *Babesia bigemina* (57%), *Anaplasma marginale* (39.5%) and *Anaplasma centrale* (28.5%). Polyparasitism was frequent: *Babesia-Anaplasma* (39.62%), *Babesia-Theileria*

(27.36%), *Babesia-Theileria-Anaplasma* (20.75%), *Anaplasma-Theileria* (12.26%). Similarly no associations were observed between sex and infection rate (prevalence) as reported by Farougou *et al.* (2007).

The results of this study revealed a prevalence rate of 4% for Trypanosome infection in trade cattle at Lafenwa abattoir, caused by *Trypanosoma congolense* was similar to a 5.9% rate reported for N'Dama in lower Benue river area by Kalu (1995) but lower than 8.5% for slaughtered cattle in Nsukka abattoir (Agu and Akuakonam, 2005). Many other prevalence rates have been reported in different areas of Nigeria in past years, both in abattoirs and on the field. Four out of 443 (0.9%) slaughtered cattle in Akwa, according to Ekejindu *et al.* (1992); Ahmed and Agbede (1993) reported

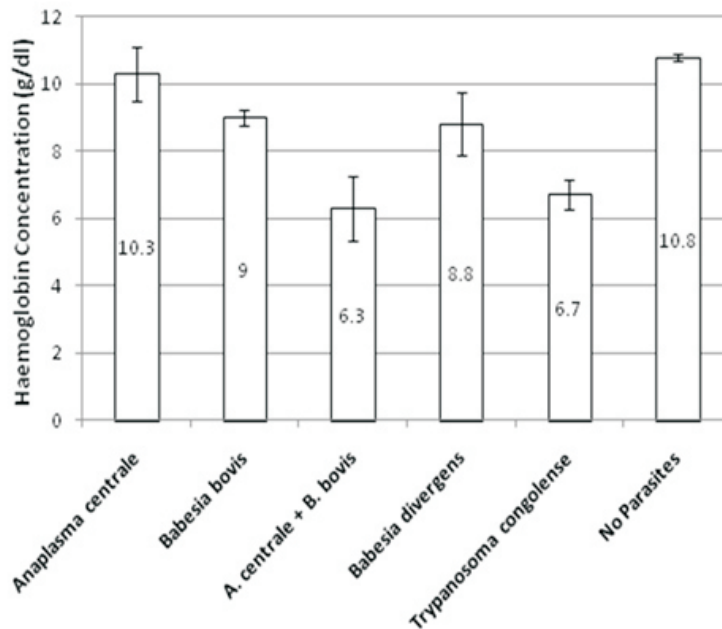


Figure 4: Effect of parasites species on Hb concentration (g/dl) of trade cattle.

21% in cattle around Zaria; Kalu *et al.* (1996) reported 21.3% in Katsina Ala LGA of Benue state; and Maikaje (1998) reported 63.5% in cattle during the rainy season in Kaura LGA of Kaduna state are prevalence rates recorded in different part of Nigeria. In most of the cases, prevalence rates are higher in field studies than in the slaughter houses studies. The relatively lower prevalence rate observed in this study, and in other abattoirs of previous works, could be due to the treatment of the trade cattle prior to selling them to slaughter men. It could also be attributed to faster method of transportation of trade cattle to markets in the south, which may reduce the contact of trade cattle from the tsetse-free zone of the north to the endemic south before slaughter. Although the animals are kept for a few days in lairage of the abattoir before slaughter, it may not be long enough

for them to be exposed to tsetse fly bites and possible trypanosome infection.

#### Conclusion

The prevalence rates observed is considered to be of epidemiological and economic importance because infected animals might be sources of infection to other healthy herds in the area of study.

#### References

- Abenga, J. N., Ewenzor, F. N. C., Lawani, F. A. G., Ezebuio, C. Sule, J. and David, K.M. 2002. Prevalence of trypanosomiasis in trade cattle at slaughter in Kaduna State, Nigeria. *J. Parasitol.* 23: 107-110.
- Agu, E.W. and Akuakonam, U C. 2005. The prevalence of Trypanosome infection in cattle and goats at

- slaughter in Nsukka, Nigeria. Proceedings of the 30th Annual Conference of the Nigerian Society for Animal Production. Pp 79-81.
- Ahmed, M.I. and Agbede, R. I. S. 1993.** A three-year retrospective study of the prevalence of trypanosome infection in Cattle, Sheep and Goats in Zaria, northern Nigeria. In: OAU/STRC. 1993, Publication No. 116, Nairobi, Kenya. pp 98–99.
- Bell-Sayki, L., Kon E.M.B., Dogbey O., Walker A.R. 2004.** Incidence and prevalence of tick-borne haemoparasites in domestic ruminants in Ghana. *Vet. Parasitol.* 124(1-2): 25-42.
- Bourdin, P. 1980.** History, Epidemiology Economic Significance of PPR in West Africa and Nigeria in Particular. Proceedings of International Workshop on PPR in Sheep and Goats. Held 24-26 September 1980 in IITA, Ibadan, Nigeria ed by D. H. Hill, pp 9-11.
- Daniel, A.D., Joshua, R.A., Kalejaiye, J.O. and Dada A.J. 1994.** Prevalence of trypanosomosis in sheep and goats in a region of northern Nigeria. *Revue d'Elev. Med. Vet. Pays. Trop.* 47:295-297.
- Darji, A., Lucas, R., Magez, S., Torreele, E., Palacios, J., Sileghem, M., Bajyana Songa, E., Hamers, R., Baetselier, D. 1992.** Mechanisms underlying trypanosome-elicited immunosuppression. *Ann. Soc. Belg. Med. Trop.* 72(Suppl 1):27–38.
- F.A.O. 1984.** Prevention of loss from tick-borne diseases and ticks in cattle imported by developing countries. In Ticks and Tick-borne Disease Control. *A practical field Manual.* Food and Agriculture Organisation, Rome, Italy.
- Fajinmi, A.O., Kalgo, A.M., Wyorkson, M.A., Yohanna, J.A. and Faleke, O.O. 2007.** Impact of trypanosomiasis on food security in Nigeria: A review. *Anim. Prod. Res. Adv.* 3: 191-194.
- Farougou, S., Tassou, A.W., Tchabode, D.M., Kpodekon M., Boko C. and Youssao A.K.I. 2007.** Ticks and haemoparasites in cattle in the north of Benin. *Revue de Med. Vet.* 158(8-9): 463-467.
- Hoare, G.A. 1972.** The trypanosomes of mammals Zoological Monograph. Blackwell Scientific Publications, Oxford, UK. 749pp
- ILRI (International Livestock Research Institute). 1996.** *ILRI 1995: Building a Global Research Institute — Highlights.* ILRI, Nairobi, Kenya.
- Jain, N.C. 1986.** Schalm's Veterinary Haematology, 4<sup>th</sup> ed. Lea and Febiger, Philadelphia. pp 63-70.
- John, P.K. 2004.** Effective and efficient Use of Agricultural Science, Technology and Research as Tools for Development in Africa: The Pan African Tsetse and Trypanosomiasis Eradication Campaign. AfriCANDO CONFERENCE. Miami, Florida, USA.
- Kalejaiye, J.O., Ayanwale, F.O., Ocholi, R.A. and Daniel I.D. 1995.** Prevalence of trypanosome in sheep and goats at slaughter. *Israel J. Vet. Med.* 50: 57–59.
- Kalu, A.U. 1995.** Prevalence of trypanosomiasis among trypanotolerant cattle at the lower Benue River area of Nigeria. *Prev. Vet. Med.* 24: 97–103.
- Kalu, A.U., Uzoukwu, M., Ikeme, M.M. and Magaji Y. 1996.** Trypanosomiasis in Nigeria: High prevalence among ruminants in Gboko Local Government Area. *Bull.*

- Anim. Hlth. Prod. Africa.* 39: 3 – 8.
- Kamani, J., Sannusi, A., Egwu, O.K., Dogo, G.I., Tanko T.J., Kemza S., Tafarki A.E. and Gbise D.S. 2010.** Prevalence and significance of haemoparasitic infections of cattle in North- Central, Nigeria. *Vet. Wld.* 3(10): 445-448.
- Maikaje, D. B. 1998.** Some aspects of the epidemiology and drug sensitivity of bovine trypanosomiasis in Kaura LGA of Kaduna State, Nigeria. Ph.D Thesis, Ahmadu Bello University, Zaria, Nigeria, 147pp.
- Nawathe, D.R., Strivastava, G. C., Basu, A.K. and Kollere, M.A. 1995.** Trypaosomiasis in small ruminants in the arid zone, Nigeria. *Bull. Anim. Hlth. Prod. Africa.* 43: 293-294.
- Woo, P.T.K. 1970.** The Haematocrit centrifugation technique for the diagnosis of African Trypanosomiasis. *Acta Tropica* 27(4): 384-386.

Received: 12<sup>th</sup> November, 2013

Accepted: 25<sup>th</sup> August, 2014