

Trypanosomosis in the Doayo/Namchi (*Bos taurus*) and zebu White Fulani (*Bos indicus*) cattle in Faro Division, North Cameroon

Achukwi, M.D.^{1*} & Musongong, G.A.²

¹ Institute of Agricultural Research for Development (IRAD), Wakwa Regional Centre, Veterinary Research Laboratory. B.P. 65 Ngaoundere, Cameroon; ² IRAD Bambui Regional centre, P.O. Box 80 Bamenda, Cameroon.

*Corresponding author e-mail: achukwi_md@yahoo.co.uk; Published online on March 4, 2009.

ABSTRACT

Objective: To determine infection rates and assess the impact of trypanosomosis on livestock production in Cameroon.

Methodology and results: A total of 296 Namchi/Doayo (*Bos taurus*) and White Fulani zebu (*Bos indicus*) cattle sampled in 26 villages within Faro Division, North Cameroon were examined by the Dark ground/phase contrast buffy-coat technique for trypanosome infections. Packed Cell Volume (PCV) and trypanosome parasitaemia levels were also measured. Ongoing trypanosome infections were detected in 14.3% of all animals examined. The infection rate was higher in Doayo (16.4%) than white Fulani (11.9%) cattle but this difference was not significant ($P>0.05$). Trypanosome parasitaemia was not significantly ($P>0.05$) influenced by the age, sex or breed of animal. *T. congolense* was the most frequently encountered trypanosome species, closely followed by *T. brucei*, *Sertaria* sp., *T. vivax* and mixed infections, in that order. The packed cell volume (PCV) was higher in Doayo than White Fulani cattle ($P<0.0001$) and in younger than older animals of both breeds ($P<0.05$). PCV was not affected by the trypanosome species or sex of animal ($P>0.05$).

Conclusion and application of findings: The study detected a significant carrier status of trypanosomosis in the Doayo cattle, which constitutes an important epizootiological risk for the more susceptible zebu type cattle and other animal species. These findings will be useful in the programming of future trypanosomosis control campaigns in the region.

Key words: prevalence, trypanosomosis, Doayo (*Bos taurus*), zebu White Fulani (*Bos indicus*) cattle, haematocrite.

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INTRODUCTION

In spite of huge budgetary allocations to the fight against tsetse flies in North Cameroon during the last three decades, trypanosomosis remains one of the most important constraints to rural development in the area. In the North region

livestock breeders recognise trypanosomosis as the number one factor limiting increase of livestock production (LSR, 1989). Conventional disease control measures used in Cameroon for close to three decades have not adequately addressed the

problem and so most of the available pastureland previously cleared of the vectors of the disease has been, in most cases, re-infested (Cuisance, 1991). Trypanosomosis is also an environmental obstacle to increase rural production and revenue returns.

The Faro Division in North Cameroon is within the tsetse fly belt on the northern fringes of the wooded savannah and was until recently the reserved home or isolation homeland of the short horn indigenous taurine (*Bos taurus*) cattle, the Namchi/Doayo. The influx into the region of nomadic zebu White Fulani/Akou cattle has been on the increase during the last two decades. Other factors, apart from the intensive use of trypanocides by the Fulani cattle breeders, may be responsible for the survival of White Fulani cattle in the region. Scientists interested in the ecological background of the region have been watching the upsurge of Fulani nomadic life into the area with keen interest. It was previously shown that Doayo

cattle developed resistance to trypanosomosis following syringe inoculation of trypanosomes (Achukwi *et al.*, 1997). The phenomenon is thought to be genetically driven and is also influenced by physiological, environmental and nutritional factors.

Assessments of the impact of trypanosomosis on livestock production in Cameroon are constrained by a paucity of quantitative epizootiological information on its infection rates. Studies that provide a more systematic coverage of key production systems and disease risk situations are required to provide more useful data. Accurate epizootiological data are crucial for the development of sustainable trypanosomosis control strategies. The present study sort to provide comparative base line data on some epizootiological aspects of trypanosomosis in the Faro Division of the North Region. Such data could be exploited during the design of sustainable trypanosomosis control strategies in the region.

MATERIALS AND METHODS

Description of the study area: The study was undertaken in Faro division, North Cameroon. The GPS coordinates taken at the foot (488 m above sea level) of the Ghanga mountain after Konglé are 13°06'32"E, and 8°30'28"N. The area is surrounded on the eastern flank by the Pintchoumba range of mountains and the Atlantika mountain range to the western border with Nigeria. Poli is the divisional headquarters and is the main town in the area. The climate is tropical to sub-humid with a dry season from November to March. The rainy season lasts from April to October with peak rainfall in August. The rainfall data collected in Fignolé, an antennae of the Institute of Agricultural Research for Development and centrally located in the study area, ranged from 40.2 mm in April to 288 mm in August. The vegetation is mainly sub-Saharan, characterized by wooded savannah with pockets of slightly dense forest occurring in the zone of the Faro National park to the south of the division. The population is mainly involved in crop (maize, groundnut and cotton) farming with secondary activities being hunting, cattle and small-scale small ruminant breeding.

Sampling and description of animals: The animals examined during the study were selected from 17 villages Viz, Poli, Boulele, Konglé, Marka, Secksekba,

Yobo, Guitcha, Beté, Nakire, Gunde, Darke, Waté, Djoumté, Heptilele, Beka Seko, TeTé and Nangwale. In each herd visited, animals aged from 8 months both Doayo (*Bos taurus*) and White Fulani cattle (*Bos indicus*) males and females were randomly sampled. Crossbred animals due to accidental mating between the Doayo and White Fulani cattle were also found in some herds of cattle and these were avoided during the sampling. Seventy percent of the herds examined had between one to five animals of the White Fulani breed.

The Doayo cattle are kept in stationary semi-sedentary herds. Non-indigenes of the Faro division prefer to call these animals the Namchi, but this name is not acceptable to the tribe (Doayo) people who keep these animals, and they prefer to call them Doayo. The breed exists exclusively in Cameroon and their homeland is in the Faro Division, North Region of Cameroon. The phenotypic characteristics of the Doayo cattle have been previously described (Tayou and Ngwa, 1987). They are small Savannah short horn cattle that are culturally and traditionally fundamental to the lives of the Doayo people in the northern fringes of the Savannah of the Adamawa plateau in Cameroon. These animals have low milk production potential and are used in cultural ceremonies such as dowry and

burial rituals. The Doayo cattle are produced in strictly stationary/sedentary herds with little or no veterinary intervention. Evolution in agricultural practices during the last decade led to the introduction of animal traction which so far involves the larger framed White Fulani and a few Doayo bulls are only recently involved in this farming system. In some kraals it was evident that the White Fulani males used for animal traction were actually crossbred with the Doayo females.

The White Fulani cattle are found in most sub-Saharan countries of Africa. The white Fulani are *Bos indicus* cattle that derive their name from their prominently white colour and the tribe of people herding them. They are quite recent invaders of the pastureland in the region of Poli, previously the geographical region in which the Doayo cattle were isolated for decades. Presently, about 50% of the Zebu White Fulani cattle are raised in semi-sedentary herds by ethnic Peuhls while the rest of the White Fulani cattle usually arrive there in the dry season for short transhumance with the nomadic Fulani families. Over the years, the same herds are mainly involved in this nomadic husbandry system. The milk producing potential of the White Fulani cattle is higher than that of the Doayo. The incursions from Fulani breeders and their cattle in the homeland of the Doayo has increased in importance during the last three decades. The husbandry system used by the nomadic Fulani cattle breeders is mainly semi sedentary involving transhumance and some veterinary attention particularly against trypanosomosis.

Packed cell volume, trypanosome detection and parasitaemia score: The Packed Cell Volume (PCV),

RESULTS

The overall trypanosome infection rate was 14.3% (Table 1). The Doayo cattle had more infections than the White Fulani cattle but the difference was not significant (Chi square value= 6.69; $P>0.05$). *T.*

a marker of anaemia, was determined using blood collected in heparinized capillary tubes, centrifuged at 12000 rpm using a Hawkey haematocrit centrifuge. The PCV value was read off a haematocrit reader. Trypanosomes were detected and quantified in the blood samples by dark ground/phase contrast buffy-coat technique (DG) (Paris *et al.*, 1982), and species of trypanosomes *T. congolense*, *T. vivax*, *T. brucei* were identified as described by Murray *et al.* (1983). Briefly, after reading the PCV, the buffy coat was cut and expressed out of the capillary onto a glass slide and covered with a cover slip for examination under a microscope to detect trypanosomes species, if present. The parasitaemia score was undertaken using the method described by Murray *et al.* (1983).

Vector presence in study area: Tsetse and tabanid fly trappings were undertaken 3 consecutive days per week for a period of one month by placing biconical traps, baited with acetone, at specific sites in the pasture on which the animals were regularly grazed. The traps were emptied each day at 18.00h. The flies collected were stored in 70% ethanol for further identification in the laboratory using a stereomicroscope.

Data analysis: The effect of breed, sex and age on trypanosome infection rates and parasitaemia levels was evaluated by chi square test. The effect of breed, sex and age on the least square means of PCV were derived by general linear modelling (GLM) using Statistical Analysis System (SAS, 1985).

congolense was the most frequently encountered trypanosome species; closely followed by *T. brucei*, mixed infections and *T. vivax* in that order (Table 2).

Table 1: Prevalence of trypanosomosis in Doayo and White Fulani cattle in Faro Division, North Cameroon.

Breed	No. examined	% infected within breed	Prevalence (%) with respect to all animals examined
White Fulani	135	11.85	5.44
Doayo	159	16.35	8.84
Both breeds	294	-	14.3

Table 2: Distribution (%) of trypanosome species and *Setaria sp* infestation with respect to cattle breed in Faro Division, North Cameroon.

Breed	<i>Trypanosoma congolense</i>	<i>T. brucei</i>	<i>T. vivax</i> *	Mixed infections	<i>Setaria sp.</i>
White Fulani	23.4	8.8	2.9	5.9	30
Doayo	29.4	17.6	5.9	5.9	70
Total	52.9	26.5	8.8	11.8	100

Mixed infections involved any two of either *T. brucei*, *T. congolense* or *T. vivax* parasites. Percentages calculated are a proportion of total detected infections of the indicated parasite i.e. * 8.8% of all trypanosome infections detected were *T. vivax* and of these 2.9% were found in White Fulani while 5.9% were present in Doayo cattle.

Vector presence: During the survey, the fly catch was very scanty. Twenty *Tabanids*, six *Glossina tachinoides* and two *Morsitan submorsitan* flies were caught. These were the most widely distributed species of trypanosome vectors in the area.

Effect of animal sex: When sex of the Doayo and White Fulani cattle was considered without breed distinction, female animals had more infections than the male, though this difference was not significant (Table

3). There were more trypanosome infected female Doayo cattle than their male counterparts. This trend was same for the WF but the differences were not significant.

Trypanosome parasitaemia score with respect to breed: Doayo animals had significantly more ($P < 0.001$) detectable parasitaemic animals (although more of low levels) than the White Fulani cattle (Table 4).

Table 3: Effect of sex on the prevalence of trypanosomosis in Doayo and White Fulani cattle in Faro Division, North Cameroon.

Sex	No. examined	% infected within sex	Prevalence (%) in all animals examined
Male	109	14.68	5.44
Female	185	14.05	8.84

Chi square value=7.76; $P > 0.05$

Table 4: Effect of breed (Doayo and White Fulani cattle) on parasitaemia levels.

Breed	No. Examined	Within breed trypanosome parasitaemia levels (% animals)		
		Zero	Low	High
White Fulani	135	97.78	0.74	1.48
Doayo	159	81.88	10.0	8.13

Chi square value=19.33; $P < 0.001$;

Packed Cell Volume with respect to sex, age, trypanosomes species and breed of cattle: The Doayo breed had a significantly higher mean ($P < 0.05$) PCV (32.5%) than the White Fulani (29.4%) (Figure 1). Age of animal significantly influenced the PCV. At all age groups the Doayo maintained a higher PCV than the White Fulani (Figure 2). Male cattle had a non-significantly ($P > 0.05$) higher mean PCV (31.38 %) than the females (30.89%). The trypanosome species that infected the animal did not significantly ($P > 0.05$) influence the PCV levels.

For both young and older cattle the Doayo breed had significantly more animals ($P < 0.05$) with detectable trypanosome parasitaemia than the White Fulani cattle (Table 5).

When each sex was taken together for both breeds, more male cattle had detectable trypanosome parasitaemia scores than female animals but this difference was not significant (Chi-Square value=2.02; $P > 0.05$). On breed basis the White Fulani and the Doayo cattle trypanosome parasitaemia were not significantly



influenced by sex (Chi-Square value= 1.146; P>0.05 and Chi-Square value= 3.925; P>0.05, respectively).

Table 5: Effect of age on trypanosome parasitaemia levels in Doayo and White Fulani cattle.

Age group	Cattle Breed	*Number examined	Within breed trypanosome parasitaemia levels (% animals)			Chi-Square value/ Probability level
			Zero	Low	High	
>6months to 3 years	White Fulani	72	95.9	1.4	2.7	9.90/ P<0.05
	Doayo	130	80.0	11.5	8.5	
>3years	White Fulani	62	100.0	0.0	0	6.41/ P<0.05
	Doayo	30	90.0	3.3	6.7	

*Animals with some missing values were excluded from the analysis. This explains the difference between number for statistics and number of animals examined. For this analysis the animals were regrouped only into two age groups (animals more than 6 months to 3 years and those more than 3 years old).

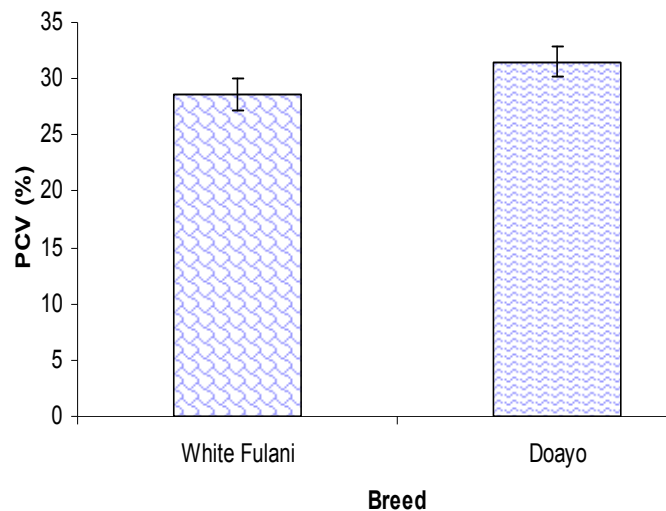


Figure 1: Packed cell volume (PCV) of Doayo and White Fulani cattle breeds in Faro Division, North Cameroon. Observed values were significantly different (P<0.001).

DISCUSSION

Despite sustained attempts to control trypanosomosis, the disease continues to be a menace to the livestock and agricultural industry in the southern fringes of the Faro division in the sahel ecological region of Cameroon. This is indicated by the overall livestock infection rate of 14.3%. It has been suggested that the infection rate could be higher if more sensitive diagnostic methods such as the polymerase chain reaction were employed (Solano *et al.*, 1999; Geysen *et al.*, 2003). The predominance of *T. congolense* infections is indicative of the high level involvement of

tsetse flies in the epizootiology of trypanosomosis in the area, though recent laboratory experiments in Burkina Faso have incriminated tabanids in the mechanical transmission of *T. congolense* (Desquesnes *et al.*, 2004). It is not certain if the finding that some animals were positive for *T. brucei* might be of zoonotic importance since domestic animals are known reservoirs of *T. b. gambiense* in West Africa (Abenga and Lawal, 2005; Van den Bossche, 2005).

Apparently, a lot needs to be done in the region on the control of tsetse for increased animal and



agricultural production to be attained. During the last decade, expansion in production of crops in the region especially maize, cowpea, groundnut and cotton was highly dependent on animal traction. Trypanosomosis directly limits the driving force of the animals used for traction. Trypanosomosis also reduces the productivity of cattle, sheep, goats and pigs which are other major species in the area, thus dictating farmers' choices

about their use of tsetse habitat for grazing. In the pastoral lands of Cameroon, trypanosomosis is likely to reduce the total livestock holdings by 15 - 40%. In mixed crop-livestock systems such as in the Faro Division, reductions in the number of animals and work efficiency of oxen have subsequent effects on crop production due to limited crop area, leading to food scarcity.

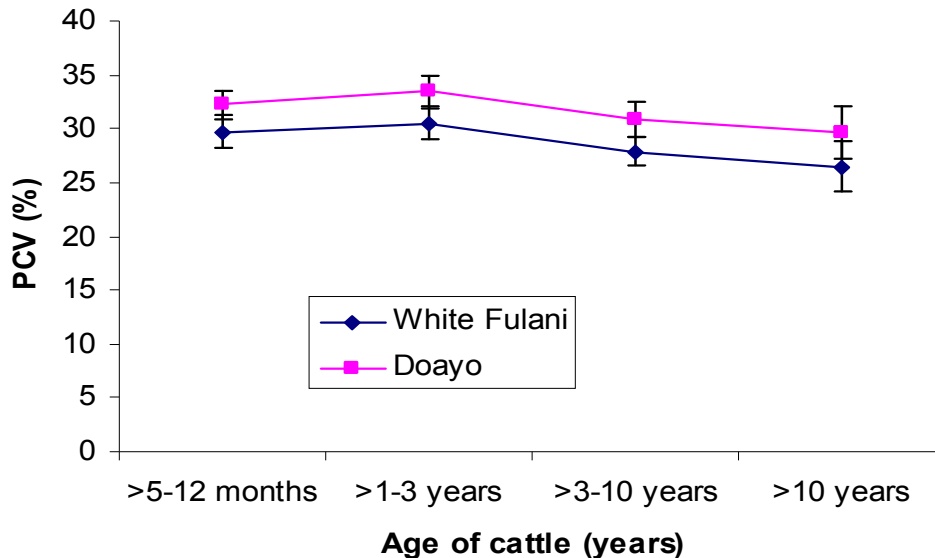


Figure 2: Effect of age and breed on Packed Cell Volume (PCV) levels in Doayo and White Fulani cattle that have evolved in a similar milieu. The observed values were significantly different ($P < 0.01$).

In the present study more Doayo cattle had detectable trypanosome infections than the White Fulani. These differences in trypanosome infection rates between the two breeds were consistently repeated within designated age groups ranging from above five months to above 10 years. The higher detectable trypanosome parasitaemia in Doayo cattle is due to lack of treatment of sick animals identified during the survey. The Doayo livestock owners are resource-poor and have very little knowledge of animal health care delivery as opposed to the Fulani who are more knowledgeable and thus more aware of the need and use of trypanocides. None of the sampled Doayo cattle breeders used trypanocides in their farms while the Fulanis frequently detected sick animals and treated them with typanocides, even in cases of wrong diagnosis. The Doayo cattle were thus found to carry high numbers of the parasite in their blood and thrived well with the infection and apparently were more resistant to the disease. Since infected

Doayo cattle resist trypanosome infection for longer periods of time, a carrier population is sustained from which the parasites are transmitted to other animals.

The frequent use of trypanocides to clear trypanosome infections in the white Fulani could be responsible for the lower infections rates recorded in these animals. The survey revealed that mortalities due to trypanosomosis in Doayo cattle herds was extremely low or absent in many farms while higher culling rates and mortalities were reported by the White Fulani herdsmen. Certainly the infected animals for both breeds were all at different stages of trypanosome infection, which was not determined. However, the higher disease impact observed in the white Fulani (WF) cattle could also be due to the recrudescence of parasitaemia in more chronically infected animals. This hypothesis suggests that the WF cattle did acquire some degree of resistance or developed some level of tolerance to trypanosomosis after prolonged years

(more than two decades) of evolution in the Faro division ecological environment, which is endemic for tsetse and tabanids, the vectors of trypanosomosis. That more male animals had detectable trypanosome parasitaemia than females is consistent with other reports on the higher susceptibility of males to parasitic infections (Klein, 2004).

Trypanosome infected Doayo and Zebu White Fulani cattle in this trypanosomosis endemic area had lower PCV values than uninfected animals, which is consistent with previous findings (Anosa, 1988; Duvallet *et al.*, 1988) indicating that trypanosomosis depressed PCV levels in infected animals. The mean PCV value for the Doayo breed (trypanosome infected or not) was higher than that of the White Fulani breed, in spite of the higher proportion of Doayo animals infected with trypanosomes or parasitaemic. Taken together, it is a strong indication of resistance to anaemia by the Doayo cattle. The PCV is the most reliable indicator of anaemia in trypanosomosis (Morrison *et al.*, 1981). This observation is certainly associated with the reported trypanotolerance of the Doayo (Achukwi *et al.*, 1979). In Togo, lower mean PCV values in trypanotolerant taurines calves than in their zebu counterparts has been reported (Ekpetsi *et al.*, 2001) but this was attributed to differences in farming systems. The cattle herds involved in the present study have lived for several decades with the vectors of trypanosomosis under a semi sedentary husbandry system. Certainly, some of the White Fulani animals had been infected and got treated, and perhaps several times too.

The scanty fly catch observed was not unexpected. The method of estimating the density of these tsetse populations has been considered somewhat imprecise as the number of tsetse caught in biconical traps depend not only upon the actual density of the tsetse populations but also upon the nutritional status of the population, the weather and the behavioral characteristics of different tsetse species. Monthly

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variations in fly density may therefore be due to these factors rather than reflecting real changes in fly density (Leak *et al.*, 1987). Various factors especially the difficulty of detecting very low density tsetse populations have contributed to conclusions that trypanosomosis exists in some locations where tsetse were apparently absent (Wells, 1972). Other factors, which can contribute to such a conclusion, include the regular movement of trypanosome-infected livestock from tsetse-infested to tsetse-free areas as noted in the study area.

It has been suggested (Bourn, 2002) that tsetse eradication is unachievable in the foreseeable future. Therefore, future disease management strategies should encompass a broad range of control options for use in different circumstances. These include animal husbandry, management of risk, avoidance of areas where animals are at risk, breeding of animals that are tolerant and drug use.

In conclusion, the reported trypanotolerance of the Doayo cattle and a single difference in the production systems, the frequent use of trypanocides or its absence, could principally account for the observed differences. The Doayo as permanent carriers of trypanosomes constitute a source of blood meals for the vectors of trypanosomosis and therefore a perpetual epidemiological risk for other domestic animals and even wildlife in the region. There is an urgent need to undertake cost-effective studies of the impact of trypanosomosis and different control options employed in the different farming systems in Cameroon.

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