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Seroprevalence of ruminant brucellosis in three selected local government areas of Taraba state

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Abstract

A serological survey of brucellosis was carried out in three selected local government areas of Taraba state to determine the current status of the disease in the field, especially in the nomadic Fulani breeding herds. A test using the *Brucella abortus* Rose Bengal Plate Test antigen to test the sera of bovine, ovine and caprine for presence of *Brucella abortus* antibodies and Milk Ring Test antigen was also carried out to determine the presence of *Brucella abortus* antibodies in milk of lactating cows. A total of 555 samples, comprising 330 sera samples and 225 milk samples were examined. 50 sera samples of bovine and 30 sera samples each of ovine and caprine, making 110 samples and 10 millitre of milk samples from 75 lactating cows were examined from each of the selected local government areas of Jalingo, Zing and Ardo-kola in Taraba state. Overall prevalence of brucellosis from the sera and milk samples were 60(18.2%) and 17(7.65%) respectively. There was a statistically significant association between the serological tests ($P<0.05$). Sera samples examined showed that 32(21.3%) bovine, 10(11.1%) ovine and 18(20%) caprine were positive using Rose Bengal Plate Test(RBPT) in the three local government areas, with Jalingo recording 22(20%), Zing 21(19.1%) and Ardo-kola 17(15.5%). Whereas milk samples examined using Milk Ring Test (MRT) showed that Zing recorded 9(12%), Ardo-kola 6(8%) and Jalingo 2(3%) positive results. This result showed that Jalingo recorded the highest sero-prevalence rate of 20%, while Zing recorded the highest prevalence of 22% in milk of lactating cows. There was no significant statistical association between location, age and sex ($P>0.05$). There is need to carry out more studies to determine the current status of the disease in the remaining local government areas and in humans.

Keywords: Brucellosis, MRT, RBPT, Seroprevalence, Taraba state

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Introduction

Brucellosis is one of the most important and widespread zoonoses in the world (Poester *et al.*, 2002). It is a bacterial zoonosis caused by six main classical species of Brucellae namely; *Brucella abortus, B. melitensis, B. suis, B. ovis, B. canis* and *B. neotomae* (OIE, 2000). In 1990's *B. ceti* and *B. pinnipedialis* were isolated from marine mammals (Cloackaert *et al., 2001*). *B. microti* was isolated from common vole and species isolated from red fox in 2009 is yet to be officially described (Hofer, 2009).

Prevalence of bovine brucellosis varies widely across Nigeria, and between herds in the same area (Mai *et al*., 2012). RBPT and MRT were used as screening tests for brucellosis (Samuel, 2002; Cadmus *et al.*, 2006; Adamu, 2009). A seroprevalence of 6.9% in cattle, 7.15%in sheep and 9.35% in goats was reported using RBPT and 7.7% prevalence using MRT was reported in Borno state (Adamu, 2009) and in sheep and goats was 11.2% in Gujba local government area of Yobe state(Tijjani *et al.,* 2010).

Factors assumed to be responsible for variation in prevalence include purchase of infected cattle from the market for replacement or upgrading, nature of animal production, demographic factors, regulatory

issues, climate, deforestation and wildlife interaction (OIE, 2011). Furthermore, one major factor contributing to the spread of the disease is the free movement of animals practiced by the nomadic Fulani herdsmen, who own about 95% of all food animal populations in Nigeria (Ocholi *et al.*, 2004). Other factors that may influence the prevalence of brucellosis in Nigeria include management system (Atsanda & Agbede, 2001), the herding of different species together (Junaidu *et al.*, 2008), use of common pastures and water sources (Bertu *et al.*, 2012), age (Cadmus *et al.*, 2008; Junaidu *et al.*, 2011), breed (Cadmus *et al.*, 2008), sex , lactation status (Junaidu *et al.*, 2011) and season (Bertu *et al.*,2012). However, other variables such as pregnancy status and state have not been assessed. All these risk factors need to be taken into consideration in designing and execution of effective control programmes in Nigeria.

Brucellosis is of great economic importance. Recent estimates of losses in meat and milk production as a result of brucellosis are $800 million annually in the USA (Richey and Harrell, 2008), in excess of $224 million in Nigeria (Esuruoso, 1979). Brucellosis infection in ruminants is endemic in Nigeria, resulting in huge economic losses due to decreased calving percentage, and delayed calving, culling for infertility, cost of treatment, decreased milk production, abortions stillbirth, birth of weak calves and loss of man-hours in infected people (Mai *et al.* 2012).

This research aims at finding the current seroprevalence and distribution of ruminant brucellosis in Taraba state according to location, age and sex with the hope of providing more efficient means of controlling the disease.

Materials and methods

Taraba state is one of the states in Northeastern Nigeria and has 16 local government areas. Sera and milk samples were collected from selected pastoralists in 3 of the local government areas of Taraba state. The selected local government areas are; Zing, Jalingo and Ardo-kola. Jalingo is the state capital. Ardo-kola local government area is closer to Jalingo and Zing local government area is furthest. The dry/rainy season common to tropical regions is also the dominant climate feature. Rainy season starts in April and ends in October, while the dry season begins in November and ends in March.

All the study animals are the indigenous breeds owned by pastoralist community. The cattle breeds are the White Fulani (Bunaji), Red Bororo (Rahaji) and the Sokoto Gudali (Bokolo), the sheep breeds are the Yankasa, Uda and the West African Dwarf, and the goats breeds are the Red sokoto and West African Dwarf (WAD).

Random sampling technique was used in selecting the pastoralists' camps and households. Since most pastoralists/households own cattle, sheep and goats, the sampling technique applied was the same. In case a selected household does not have sheep and/or goats, the most immediate household that has such animals were sampled (Cattle <36 months term as Young, >36 months Adult. Sheep & Goats <12 months Young & >12 months Adult)

A total of 555 samples comprising 330 sera samples and 225 milk samples were used in this study. The sera samples were collected from cattle, sheep and goats following standard procedures for detection of Brucella antibodies. Of these 330 sera samples, 150 are from cattle, and 90 each for sheep and goats respectively. 50 sera samples of cattle and 30 sera samples each from sheep and goats are taken from each of the three (3) local governments. No sample was collected from any herd/flock that used *Brucella* vaccine, especially in Jalingo local government were commercial farms are situated.

5mls of blood were drawn from jugular vein of apparently healthy cattle, sheep and goats using sterile needle and syringe and gently transferred into glass sample bottles (vaccutainer tubes). Individual samples were identified using numbers and alphabets to indicate their origin (identity of the animal, sex, age, herd/flock size and source of animal). About 10mls of midstream milk from each selected lactating cow was collected into a clean sterile plastic sample bottle during morning milking. The Rose Bengal Plate test (RBPT) and Milk ring test were used to screen for *Brucella* antibodies in sera and milk. The procedure described by Nielsen and Dunkan (1990) was followed. The antigen used was from Veterinary Laboratories Agency (VLA, UK).

Excel package (Microsoft Excel spread sheeth 8.0) was used to store the serological data. Simple percentages and Chi-square were used in the analysis of the data. Differences of means were considered significant at $p< 0.05$.

Results

Data from 555 samples comprising 330 sera samples and 225 milk samples were available for analysis. The herd-level seroprevalence of brucellosis using RBPT in the three local government areas was 18.2% (table 1). Of the 60 samples that were seropositive,

32(21.3%) cattle, 10(11.1%) sheep and 18(20.0%) goats.

A total of 330 sera samples were tested with RBPT. Of the 32 cattle that were positive, 10 (31.3%) male and 22(68.7%) females, while 20(62.5%) adults and 12(37.5%) young animals (table 2). Sheep 10 were sero-positive, 3(30%) male and 7(70%) females, while 9(90%) adults and 1(10%) young. Eighteen goats were positive, out of which 4(22.2%) male and 14(77.8%) females and 16(88.8%) adult and 2(11.2%) young (table 2). There was no significant difference in sero-prevalence between male and female (p=1.3639) and between adult and young (p=0.3017) animals.

One hundred and ten sera samples were analyzed from each of the three local government areas, 22(20.0%) of the samples in Jalingo local government were seropositive, 21(19.1%) zing and 17(15.5%) Ardo-kola local government areas (Table 3). Seropositive samples were highest in Jalingo local government area, followed by Zing and then Ardo-Kola local government.

Seventy-four milk samples from each of the three local governments was tested with MRT. Overall positive samples was 17(7.6%). Of the 17 positive samples, 2(3%) from Jalingo, 9(12%) Zing and 6(8%) Ardo-kola local government areas (table 4). *Brucella abortus* agglutinin in milk of lactating cows was highest in Zing, followed by Ardo-Kola and then Jalingo local government. There was a significant difference between RBPT and MRT tests used in this study (p=12.6128).

Table 1: Sero-Prevalence of ruminant brucellosis in three selected Local Governments Area of Taraba State

Specie examined	No. examined	No. positive(%)
Cattle	150	32(21.3)
Sheep	90	10(11.1)
Goats	90	18(20.0)
Total	330	60(18.2)

Table 2: RBPT of sera from cattle, sheep and goats samples in three selected Local Government Areas of Taraba State

Specie (%+ve)		Sex (%+ve)		Age(%+ve)	
Cattle	32(21.3)	Male	10(31.3)	Adult	20(62.5)
		Female	22(68.7)	Young	12(37.5)
Subtotal	32(21.3)		32(21.3)		32(21.3)
Sheep	10(11.1)	Male	3(30.0)	Adult	9(90.0)
		Female	7(70.0)	Young	1(10.0)
Subtotal	10(11.1)		10(11.1)		10(11.1)
Goat	18(20.0)	Male	4(22.2)	Adult	16(88.8)
		Female	14(70.0)	Young	2(11.2)
Subtotal	18(20.0)		18(20.0)		18(20.0)
Grand Total	60(18.2)		60(18.2)		60(18.2)

Table 3: Distribution by location of ruminant brucellosis in three selected Local Government Areas of Taraba State

Location (LG)	Species	No. examined	No. positive (%)
Jalingo	Cattle	50	8(36.4)
	Sheep	30	5(22.7)
	Goats	30	9(44.9)
	Subtotal	110	22(20.0)
Zing	Cattle	50	12(57.2)
	Sheep	30	2(9.5)
	Goats	30	7(33.3)
	Subtotal	110	21(19.1)
Ardo-Kola	Cattle	50	12(70.6)
	Sheep	30	3(17.6)
	Goats	30	2(11.8)
	Subtotal	110	17(15.5)
	Total	330	60(18.2)

Table 4: MRT of cattle milk sampled in three selected Local Government Areas of Taraba State

Location	No. examined	No. positive (%)	Percentage positive
Jalingo	75	2(3.0)	11.8
Zing	75	9(12.0)	52.9
Ardo-Kola	75	6(8.0)	35.3
Total	225	17(7.6)	100

Discussion

This study showed that ruminant brucellosis in both sera and milk of lactating cows is present in the three local government areas of Taraba state with an overall prevalence of 18.2% and 7.6% respectively. The overall seroprevalence of 18.2% was comparable with the findings of other workers in Nigeria; 6.28% by Ishola and Ogundipe (2001), 5.82% by Cadmus *et al. (*2006), 6.0% by Cadmus *et al.* (2010) and 10.35% by Alhaji and Wungak (2013). Prevalence in other African countries indicated 8.4% in Cameroon (Bayemi *et al.,* 2009), 7% in Chad Schelling *et al.* (2003), 4.9% in Ethiopia Mekonnene *et al.* (2010), 4.2% in Eriteria Omer *et al.* (2000) and 3.3% in Central African Republic Nakoune *et al.* (2004). These contrasting findings could be either related to the overall cattle prevalence status of the disease or number of cattle per the studied (herd sizes).This result contrast with 4.04% recorded among pastoralist in Jigawa state (Farouk *et al.,* 2011). The positive seroprevalence in this study is inversely proportional to the distance from urban areas because movement and trade in cattle and other ruminants across the country as well as the nomadic nature of the pastoral Fulanis may have contributed to high infection rates (Cadmus *et al.*, 2008; Bertu *et al.*, 2012).

Ruminant brucellosis prevalence of 18.2% in the three local governments studied agrees with the report of Bertu *et al.* (2010) in Mangu and Quanpan Local Governments of Plateau state, but is lower than in Shendam and Bassa local governments. However, Onoja *et al.* (2008) reported the highest seroprevalence rate of 76% sheep in Zaria, Nigeria. The result indicates that in cattle there was virtually no difference in prevalence between adults (21.5%) and young (21.1%). Sheep showed a higher prevalence of 20% in adults and 10.6% young whereas in goats also adults showed a slightly higher prevalence of 20.3% compared to 18.2% in the young. Seroprevalence rate of 32.2% cattle, 22.35% sheep, 30.76% goats and 7.14% in prison inmates in Sokoto Prison Farm was reported (Junaidu *et al.*, 2008). However, Farouk *et al., (*2011) in a study in Jigawa state also reported that prevalence increases as the animal matures, which might be true even among the matured ones.

This study shows that in cattle, sheep and goats, female animals showed a higher seroprevalence than males. The possible explanation to the variation could be due to the fact that females stay longer in the herd for the purpose of reproduction and breeding. In contrast to this finding Adamu *et al.* (2007) reported that in ruminant brucellosis, infection rates were uniform for both males and females and that there was no significant epidemiological sex-linked association in infection rates.

The overall prevalence of *Brucella abortus* agglutinins in milk of lactating cows is 7.6% and Zing recorded the highest infection rate of 12%, Ardo-Kola 8% and Jalingo 3%. . The result of this study, however, contrasted with a study by Adamu and Ajogi (1999) that reported 13.8% prevalence rate in Kano, 15% in Fulani cattle herds in Kaduna, kano and Borno states while Bertu *et al.* (2010) reported 12% among milk sellers in Jos and environs. The results of this study was lower compared to a study by Samuel (2002) who reported 26.7% in lactating cows in the middle belt states and south-east Nigeria. The infection rate in this study increases is proportional to the distance to the urban areas. This might be due to increase in awareness of the dangers of consuming milk and milk products that were not properly processed by urban dwellers which is more in the urban areas than in the rural areas. The demonstration of *Brucella abortus* antibodies in fresh milk of cows in this study is significant and shows that infected cows are potential hazards to consumers of milk and milk products.

In conclusion, the result demonstrated that ruminant brucellosis is prevalent in the three local government areas of Taraba state. The high prevalence observed calls for urgent government intervention towards public health enlightenment on the zoonotic of the disease. Integrating vaccination against brucellosis into the annual vaccination programme of livestock is highly recommended.

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