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Seroprevalence of *Brucella* Antibodies in Goats in Oju, Benue State, Nigeria

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ABSTRACT

A seroprevalence study of *Brucella* antibodies in goats in Oju Local Government Area (LGA) of Benue State, Nigeria was undertaken to determine its prevalence. A total of 241 blood samples were collected and subjected to Rose Bengal Plate Test (RBPT) and Indirect Enzyme-linked Immunosorbent Assay (iELISA) to determine the presence of *Brucella* antibodies. The RBPT gave a prevalence of 33 (13.7%) while the iELISA confirmed the presence of *Brucella* antibodies in 18 (7.5%) of the sera tested. Based on age, 3 (7.0%) of the 43 goats below 12 months were positive, 7 (7.2%) of the 97 goats between 13-36 months were positive and 8 (7.9%) of the 101 goats above 36 months were positive for the iELISA. Of the 49 male goats sampled, 3 (6.1%) of the male goats were positive and 15 (7.8%) of the 192 female goats were positive for iELISA while breed-based prevalence rates gave 15 (7.0%) in the Kano brown breed and 3 (10.7%) in the West African dwarf breed. There was no significant association between prevalence rates of *Brucella* antibodies by age, sex or breed of goat sampled ($p > 0.05$). Due to the public health significance of caprine brucellosis, there is a need to embark on brucellosis control and eradication in Oju LGA and an awareness campaign should be carried out to enlighten goat owners/handlers on this important zoonosis. Efforts should be geared at improving livestock health through vaccination.

Key words: Seroprevalence, *Brucella* antibodies, goats, Oju, zoonosis

INTRODUCTION

Brucella melitensis which is the main aetiologic agent of brucellosis in goats, was the first species described in the genus *Brucella* and it was first isolated by Bruce (1887) and Alton (1990) from the spleens of soldiers dying of Mediterranean fever on the island of Malta. It is a "Classic brucella" causing brucellosis mainly in goats, sheep and humans. Brucellosis has been defined as a zoonotic and contagious systemic bacterial disease primarily of ruminants but also affecting man and other livestock, characterized by inflammation of the genital organs and foetal membranes, abortion, sterility and formation of localized lesions in the lymphatic system and joints (WHO, 1971; CDC, 2005). Goats and sheep are the natural reservoirs of *B. melitensis* and all breed of goats are susceptible to infection by it (Radostits *et al.*, 2006).

The infection is important as a major cause of economic losses in the livestock industry and Nigeria's food animals' population is estimated at 15.2 million cattle, 23 million sheep and 28 million goats (FAO, 2006). The role of brucellosis in limiting livestock production and its economic impact on the livestock industry in Nigeria is widely recognised (Esuruoso, 1979; Rikin, 1988;

Ajogi and Akinwumi, 2001). There are serological reports of brucellosis in small ruminants in various parts of Nigeria (Cadmus *et al.*, 2006; Junaidu *et al.*, 2008; Bertu *et al.*, 2010; Junaidu *et al.*, 2010) who reported prevalence rates of 0.86, 7.96, 16.1 and 10.9%, respectively.

The greatest prevalence of brucellosis in man is found in those countries with a high incidence of *B. melitensis* infection among goats and sheep and as a zoonosis of great importance, there is a significant loss in human productivity due to it (Madkour, 1989). Brucellosis in humans is hardly diagnosed in hospitals in Nigeria despite suggestions that the magnitude of infections may be greater than appreciated (Njoku, 1995; Chahota *et al.*, 2003). In the case of Benue State, there is no known report of brucellosis in hospital patients in the entire area (Ofukwu *et al.*, 2004).

Recent studies on brucellosis in Nigeria suggest increasing trend in the prevalence of the infection in various parts of the country and epizootiological investigations also revealed that results obtained varied depending on the region, area or animal group sampled (Bertu *et al.*, 2010). This trend makes it necessary to establish the prevalence of the infection in Oju where goat is the major livestock kept and which has a well established goat market. Also, in Oju, chevon is the most consumed meat and it is eaten at all festivities. There was no documented data on caprine brucellosis from Oju LGA of Benue State hence, the need to carry out study on the sero-prevalence of *Brucella* antibodies in goats in this locality.

MATERIALS AND METHODS

The study area was Oju LGA, Benue State, Nigeria. Oju is located in the South Senatorial zone of Benue State and in the southern guinea savannah of Nigeria. It lies within latitude 6°50'43N and longitude 8°25'3E with an altitude of 180 m (593 ft). Total annual rainfall range is 1500-1750 mm and the monthly mean temperature is 16-37°C. Oju has an estimated population of 180,000 million (NPC, 2006). The inhabitants are the Igede speaking people of Benue State. It is home to the College of Education, Oju and also home to a popular Christian mission at Egga called Elim. Agriculture is the mainstay of the economy and livestock production, which is mainly goat, is kept on the semi-intensive. This study was performed between September and November 2013.

Sample size was determined by using the equation of Thrusfield (1997) at 95% confidence level and prevalence rate of 10.1% as reported by Bertu *et al.* (2010) was used:

$$N = \frac{Z^2 pq}{d^2}$$

Where:

N = Sample size

Z = Appropriate value for the standard normal deviate for the desired confidence = 1.96

p = Prevalence

q = 1-p

d = Level of significance (0.04) decreased in this case to get an increased sample size

Therefore:

$$N = \frac{1.96^2 \times (0.101 \times 0.899)}{(0.04)^2} = 218$$

Oju has a goat market and this goat market was used as the sampling unit as goat owners from communities in the LGA bring goats for sale at the Onyike (Ihiejwo) market. Simple random sampling was performed. Blood samples were collected after authorisation from market authorities and goat owners who consented. The market operates every five days and sampling was done for eight weeks. Blood samples were also collected from goat owners in the randomly selected communities of Ikachi, Ogengeng, Ikachi Road, Egga, Umoda and Zion Hill within the LGA. Eighty six samples were collected from goats sold at the Onyike market, 21 from herds in Ikachi community, 38 from Ogengeng, 31 from Ikachi Road, 15 from Egga, 17 from Umoda and 33 from Zion Hill within the LGA.

Goats were properly restrained and the ages were determined, sex and breed were ascertained and information on the management system was obtained from the owners/handlers. Five millilitres of venous blood was aseptically collected from the jugular vein into a clean and well labelled sample bottle devoid of anticoagulant using sterile hypodermic needle and 10 mL syringe. The blood samples were allowed to clot by laying the sample bottles in a slanting position for an hour and the sera obtained by decantation into new well labelled sample bottles with sample number, age, sex and breed. Serum samples were then transported on a weekly basis to the Bacterial Zoonoses Laboratory of the Department of Veterinary Public Health and Preventive Medicine, Ahmadu Bello University, Zaria in a Coleman box with ice packs and stored at -20°C before being used. A total of 241 serum samples were collected.

Rose bengal plate test (RBPT): The antigen, negative and positive controls for the test were obtained from ID.vet, France. The procedure was performed as described by Alton *et al.* (1988).

Indirect enzyme-linked immunosorbent assay (iELISA): The indirect ELISA kit including negative and positive controls was obtained from ID.vet, France. This diagnostic kit is designed to detect antibodies directed against *Brucella melitensis*, *Brucella abortus* and *Brucella suis* and it can be used in caprine, ovine, bovine and porcine individual serum and plasma or in bovine pools up to 10. The test procedure was performed as instructed by the kit manufacturer.

Statistical analysis: All the data obtained was statistically analyzed using GraphPad Prism 4 for Windows. Results are presented using bar chart and tables. Chi-square was used to test association between the prevalence of antibodies and factors such as age, sex and breed of goat sampled.

RESULTS

All serum samples were subjected to RBPT which gave a sero-prevalence of 33 (13.7%) and iELISA which confirmed the presence of *Brucella* antibodies in 18 (7.5%) of the goats in Oju LGA as shown by Fig. 1.

Based on age, 4 (9.3%) of the goats below 12 months were positive, 17 (17.5%) of goats between 13-36 months were positive and 12 (11.9%) of those above 36 months were positive for the RBPT while 3 (7.0%) of the goats below 12 months were positive, 7 (7.2%) of those between 13-36 months were positive and 8 (7.9%) of those above 36 months were positive for the iELISA as presented in Table 1.

Of the 49 male goats sampled, 6 (12.2%) were positive and 27 (14.1%) of the females were positive for RBPT while 3 (6.1%) of the males were positive and 15 (7.8%) of the female goats were positive for iELISA (Table 1).

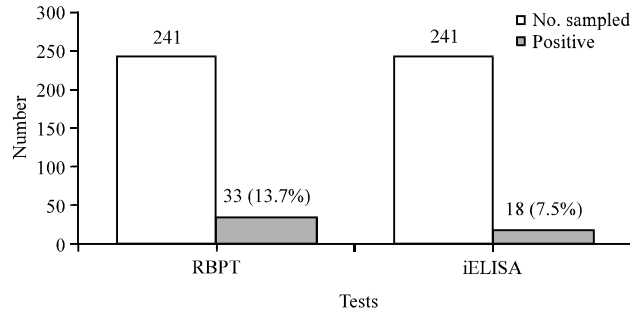


Fig. 1: Seroprevalence of *Brucella* antibodies in goats in Oju using RBPT and iELISA

Table 1: Age, sex and breed-based sero-prevalence of *Brucella* antibodies in goats in Oju LGA using RBPT and iELISA

Factors	No. tested	RBPT positive		iELISA positive		χ^2	df	p-value
		No.	%	No.	%			
Age (months)								
Below 12	43	4	9.3	3	7.0	0.05386	2	0.9734
13-36	97	17	17.5	7	7.2			
Above 36	101	12	11.9	8	7.9			
Total	241	33	18.0					
Sex								
Male	49	6	12.2	3	6.1	0.16130	1	0.6879
Female	192	27	14.1	15	7.8			
Total	241	33	18.0					
Breed								
Kano brown	213	28	13.2	15	7.0	0.48280	1	0.4871
West African dwarf	28	5	17.9	3	10.7			
Total	241	33		18				

Breed-based prevalence gave 28 (13.2%) in Kano brown breed and 5 (17.9%) in West African dwarf breed for the RBPT while 15 (7.0%) of the Kano brown breed and 3 (10.7%) of the West African dwarf breed were positive for the iELISA (Table 1).

DISCUSSION

The sero-prevalence of *Brucella* antibodies in goats in Oju LGA obtained in this study is 7.5% as confirmed by the iELISA. The semi-intensive system of management practiced by goat owners and the convergence of goats at the market for sale and subsequent return of unsold goats to the rest of the herd could be responsible for the spread of the infection in this locality. While some previous researchers reported higher prevalence rates, others reported lower prevalence rates compared to this finding. Bertu *et al.* (2010) reported a similar rate of 7.0% from goats in Bassa LGA of Plateau State which is in the same geopolitical zone (North-Central Nigeria) as Benue State. A slightly higher prevalence rate of 10.9% for *B. melitensis* in a study of the seroprevalence of brucellosis in goats in Sokoto State, North-West Nigeria was obtained by Junaidu *et al.* (2010) while a much higher value of 45.75% was obtained by Ojo *et al.* (2007) in a study of a goat herd in Abeokuta, Ogun State, South-West Nigeria. Much lower prevalence rates of 2.3 and 1.7% for Quanpan LGA and Shendam LGA, respectively of Plateau State were obtained by Bertu *et al.* (2010). Tigist *et al.* (2011) reported a prevalence rate of 4.2% of caprine brucellosis in South Omo Zone of Southern Ethiopia.

There was no significant association between *Brucella* infection and age ($p>0.05$) although the prevalence increased with age. Oloffs (1996, 1998) had stated that *Brucella* infection increases with age and most diseased animals carry the infection throughout their lives.

Although, females had higher prevalence than males, there was no significant association between brucella infection and sex ($p>0.05$). Studies carried out by Muma *et al.* (2006), indicated that *Brucella* antibody titres are not associated with sex. However, Radolf (1994) had stated that allantoic factors including erythritol, possibly steroid hormones and other substances stimulate the growth of most of the Brucellae. Keppie *et al.* (1965) also stated that erythritol, which is a polyhydric acid is found in higher concentration in the placenta and foetal fluids of females than in seminal vesicles and testes of males and this could be responsible for the observed differences in prevalence rates between the sexes.

Although, the West African dwarf breed had higher prevalence rate than the Kano brown breed, there was no significant association between brucella infection and breeds of goats ($p>0.05$) Ajogi *et al.* (2002) had stated that on sex and breed distribution, brucellosis is known to be neither breed nor sex specific.

A coordinated eradication programme including large scale sero-monitoring exercise of goats and human beings at risk, routine testing of goats, vaccination, culling of affected goats with compensation and a public health education is therefore recommended. The public health enlightenment should address the zoonotic aspect of caprine brucellosis.

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