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Prevalence of Brucellosis in Food Animals Slaughtered at Damaturu Abattoir, Yobe State, Nigeria

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ABSTRACT

Serological survey of brucellosis in slaughtered food animals was carried out in 318 cattle, 300 sheep and 400 goats slaughtered in Damaturu, Yobe state in arid zone of north eastern Nigeria, from the month of July to October, 2007. Sera collected from the animals were tested using both Rose Bengal Plate Test (RBPT) and Serum Agglutination Test (SAT). The results obtained from both RBPT and SAT were comparable. The prevalence rates of 5.7%, 6.0% and 4.0% with RBPT for cattle, sheep and goat respectively were obtained in the study and were significantly associated ($p<0.0001$). The infection rates of 6.3 and 5.5%; 0.0 and 6.8% and 5.4 and 17.4% for male and female cattle, sheep and goats respectively were obtained. The results were not statistically associated among male and females of cattle ($p=0.7665$) and sheep ($p=0.1433$) respectively. However, the infection rate was significantly associated in male and female goats examined ($p=0.0012$). This study has confirmed that brucellosis is still endemic among the slaughtered animals in the study area and the prevalence is on the increase especially among the small ruminants.

Key words: Prevalence, brucellosis, small ruminants, abattoir, zoonosis

INTRODUCTION

Brucellosis is a common zoonotic disease in many parts of the world. It is particularly common in Mediterranean countries, the Middle East, the Arabian Peninsula, Central and South America, Asia and Africa. It is caused by bacteria of the genus brucella and is small, non-encapsulated, non-motile, non-sporing, gram negative, aerobic coccobacilli which are intracellular pathogens (Madkour, 2001). The main etiology of bovine brucellosis in the field is *Brucella abortus*; *B. melitensis* infections have been reported and *B. suis* infection suspected (Domenech *et al*., 1983; Chukwu 1985). *Brucella melitensis* mainly infects sheep and goats and in areas where *B. melitensis* is enzootic it is the major cause of abortion in those animals and very often also in the cattle (Zowghi and Edadi, 1985; Zowghi and Edadi, 1988).

Humans usually acquire the disease by consumption of infected meat, raw milk and milk products (Thapar and Young, 1986). Veterinarian may become infected with brucellosis when handling aborted foetuses or apparently healthy calves borne to infected cows, performing gynaecological and obstetric manipulations or when handling Rev. 1 vaccine (Glosser, 1972; Schnurrenberger *et al*., 1975; Dekeijzer; 1981).

Outbreaks of brucellosis have caused significant economic losses; farmers suffer loss of income due to abortion, the consequent loss of milk production and a prolonged fattening time due to birth of premature animals and low fertility rate. In human, it is a disease of protean manifestations, affecting various body organs, systems and tissues. It has non specific clinical, haematological, biochemical or imaging of its own that distinguish it from other febrile illnesses (James 1990; Madkour 1996, 1998; Malik 1997).

In 1986, bovine brucellosis was reported in 120 out of 175 countries; 33 countries did not record the disease and data were not available for the remaining (Crawford *et al*; 1990). Brucellosis has been reported in almost all countries in Africa (Refai, 2002) and considered to be one of the most serious diseases facing the Veterinary Profession (Chukwu, 1987). In pastoral system, in the semi-arid areas, serological prevalence is almost always greater than 5% (Jiwa *et al*., 1996; Kadohira *et al.*, 1997; Domingo, 2000). The high and variable sero-prevalence of brucellosis is associated with differences in the sensitivity and specificity of the different serological tests used;

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large herd size, extensive movement of cattle and mingling with other herds at common grazing and water points (Kadohira *et al*., 1997). While smaller, more restricted-grazing flocks have a lower prevalence (Bekele and Kasali, 1990; Reichel *et al*., 1996; Kabagambe *et al*., 2001). Bovine brucellosis prevalence rates ranging from 3.3% for Central African Republic (Nakoune *et al.*, 2004) to as high as 41% for Togo have been reported (Domingo, 2000). Values falling within this range were reported for Chad (Schelling *et al*., 2003), Sudan (El-Ansary *et al*., 2001), Burkina Faso (Coulibaly and Yameogo, 2000), Ghana (Turkson and Boadu, 1992, Kubuafor *et al*., 2000), Mali (*Tounkara et al*., 1994), Nigeria (Ocholi *et al*., 1996) and Zimbabwe (Mohan *et al*., 1996). For goats, prevalence of 4% has been reported from Sudan (El-Ansary *et al*., 2001) while 2% was reported in Uganda (Kabagambe *et al*., 2001).

In Nigeria, several authors have reported brucellosis in Nigerian livestock (Okoh, 1980; Falade and Shonekan, 1981; Bale *et al*., 1982; Ogundipe *et al*., 1994; Brisibe *et al*., 1996; Ajogi *et al*., 1998, Ishola *et al*., 2001 Cadmus *et al*., 2006), with evidence of the spread of the disease in all parts of the country. This is usually accompanied by severe economic losses. Serological prevalence rate of between 0.20% and 79.70% have been reported in various parts of the country to date. However, the infection is not static; it is evident from previous studies that prevalence varies at different times and locations. This is especially apparent where there is no control policy, like Nigeria. There is a pattern of low and high prevalence in specific areas of the country and prevalence variability also arises between herds in the same area (Nuru and Dennis, 1975).

Conventional serological tests, e.g., the serum agglutination test (SAT) and the rose bengal test (RBT), are the standard tests recommended as screening tests in the field (Blasco *et al*., 1994). The paucity of data on brucellosis especially in Yobe State informed the decision for this work with the ultimate aim of utilising the finding to estimate level and the epidemiology of the disease and also to stimulate further research.

MATERIALS AND METHODS

Study area

The study was carried out at Damaturu abattoir, the state capital of Yobe state, Nigeria from the month of July to October 2007. The state is located in the semi – arid zone of North – eastern Nigeria with an estimated land mass of 47,153 square kilometres and is one the highest livestock producers in the country (Bourn *et al*., 1994). The arid zone has rather austere climatic conditions with a hot dry season from late January to late June during which average daily peak temperatures, especially in April and May, are 34.4 to 37.8°C. The rainy season lasts from late June to mid September and provides an annual average of 46.3 cm rainfall. The cold north-easterly trade wind blowing across the Sahara desert in October to January brings with it cold and desiccant effects on the environment (Brisibe, e*t al.,* 1996). Damaturu was selected as sampling point because animals are brought from all over the State for sale and slaughter.

Sample collection, processing and preservation

Blood samples from apparently healthy cattle, sheep and goats were aseptically collected from each animal at the time of slaughter. Samples were collected from 318 cattle, 300 sheep and 400 goats. Ten ml of blood from each animal were collected into a labelled, clean, sterile bottle. The samples were kept in slanted position in an ice – packed plastic cooler before being transported to the laboratory. The samples were centrifuged at 1500 rpm for ten minutes to obtain clear serum samples. The sera were kept in sterile vials, labelled and stored in a freezer at – 20º C until time of testing.

Serological tests

Tests employed were the Rose Bengal plate Test (RBPT) and Serum Agglutination Test (SAT). Standard RBPT antigen obtained from the Central Veterinary Laboratory, Weybridge, UK was used. The tests were performed as described by Alton *et al* (1975) and the modified-RBPT for small ruminants by Blasco *et al* (1994). A drop (25 μl) of each serum sample of cattle, using a clean Pasteur pipette was placed on a white tile and an equal volume of antigen placed near each serum spot. For small ruminants' sera, 3 drops (75μl) with equal volume of antigen were placed beside each other. The serum and antigen were mixed thoroughly (using a clean glass rod for each test) to produce a circular or oval zone approximately 2 cm in diameter. The mixture was manually agitated gently for 4 minutes at ambient temperature. Serum samples with agglutination immediately after the 4-minute period was considered positive and those that showed no signs of agglutination after 4 minutes were recorded as negative.
For each serum sample that was positive in the RBPT, SAT was performed. A serial dilution of the serum from 1:10 up to 1:160 was made. To a volume of 0.8 ml of phenolised saline in the first tube was added 0.2 ml of serum sample and 0.5 ml transferred from it to the second tube containing 0.5 ml phenolised saline and so on and 0.5 ml discarded from the 5th tube. Equal volume (0.5 ml) of diluted (1:10) antigen was added to each test tube, mixed thoroughly and incubated at 37°C for about 24 hours. Reactions were recorded as positive if serum-antigen mixture was clear with precipitate at the bottom which was not disrupted by gentle agitation. If the mixture was turbid and

gentle shaking revealed no precipitate at the bottom, the sample was recorded as negative. Samples in which agglutination occurred at a dilution of 1:40 (50 IU) and above were recorded as positive and reactors (Morgan *et al*., 1978).

Statistical analysis

Chi square analysis and Fisher's exact test were used to analyze the data generated from the studies.

RESULTS

With RBPT, 18(5.7%) out of the 318 cattle were found positive, consisting of 4(6.3%) of the 64 male and 14(5.5%) of the 254 female. Of the 300 sheep, 18(6.0%) were positive, which comprised 0 (0%) of the 36 male and 18(6.8%) of the 264 female; and out of the 400 goats, 56(14.0%) were positive, which also comprised 6(5.4%) of the 112 male and 50(17.4%) of the 288 female (Table 1). The result from the SAT is also in Table 1 and was used to complement the RBPT.

Table 1. Species and Sex distribution of brucellosis in food animals slaughtered at Damaturu abattoir, Yobe State, Nigeria

Species	Total No. of animals examined	Sex	No. of animals examined	No. (%) of animals positive	
				RBPT	SAT
Cattle	318	Male	64	4 (6.3)	4 (6.3)
		Female	254	14 (5.5)	12 (4.7)
Sheep	300	Male	36	0 (0.0)	0 (0.0)
		Female	264	18 (6.8)	16 (6.1)
Goats	400	Male	112	6 (5.4)	5 (4.5)
		Female	288	50 (17.4)	47 (16.3)

The infection rates of 5.7%, 6.0% and14.0% with RBPT and 5.0%, 5.3% and 13.0% with SAT for cattle, sheep and goat respectively were significantly associated ($p<0.0001$). The infection rates were not statistically associated among male and females of cattle ($p=0.7665$ and $p=0.5384$) and sheep ($p=0.1433$ and $p=0.2328$) for both RBPT and SAT respectively. However, the infection rates were significantly associated in male and female goats examined for both RBPT ($p=0.0012$) and SAT ($p=0.0009$).

Breed wise, distribution of positive cattle sera were Red Bororo 7(5.8%), Sokoto Gudali 3(4.4%), White Fulani 5(6.3%) and Rahaji 3(6.0%). In sheep, 12(9.6%) sera samples of Yankassa, 2(2.1%) of Balami and 4(4.9%) of Uda; and in goats 23(19.2%) Borno White, 9(9.2%) Sokoto Red and 24(13.2%) Kano brown was positive using the RBPT. The results from SAT are presented in Table 2. The infection rates were not statistically associated ($p>0.05$) amongst all the breeds of the animals studied.

DISCUSSION

The prevalence rates of 5.7, 6.0 and 14.0% observed for cattle, sheep and goats respectively in this study are comparable with those reported in the pastoral system, in the semi-arid areas of Africa. The prevalence of 5.7% in cattle is comparable to 6.28% (Ogundipe and Ishola, 2001), 5.82% (Cadmus *et al*., 2006). However, prevalence of 6.0 and 14.0% for sheep and goats respectively were higher than the earlier reported prevalence of 4.8 and 6.0% respectively in Borno and Yobe States (Brisibe *et al*., 1996). This may suggest likely increase in the rate of infection in the study area and in the country since the area is one of the major livestock producers. The difference may also be attributed to variation in the period the study was conducted. Because sheep and goats are important source of animal protein in regular diet and special occasions, the epidemiological and zoonotic implications of increased prevalence are the likelihood of increase spread to susceptible animals and human beings through aborted fetuses, uterine discharges, meat and milk products especially with the kind of management practice of mixing different animal species in a flock.

The significant association in the infection rates between the male and female goats was in agreement with earlier reports, though the results based on sex in both cattle and sheep were in contrast. These may suggest that

sex may or may not play an important role in the transmission of the disease depending on the species of animal. On the other hand, since the numbers of screened animals from each sex are not the same, this may have contributed to the disparity in the observed rates. The no statistical association among all the breeds of animal species studied suggests that breed may not be a factor in the susceptibility of the animals to the disease.

Table 2. Breed distribution of brucellosis in food animals slaughtered at Damaturu abattoir Yobe State, Nigeria.

Species	Breed	No. of animals examined	No. (%) of animals positive	
			RBPT	SAT
Cattle	Red Bororo	120	7 (5.8)	6 (5.0)
	Sokoto Gudali	68	3 (4.4)	3 (4.4)
	White Fulani	80	5 (6.3)	5 (6.3)
	Rahaji	50	3 (6.0)	2 (4.0)
	Total	318	18 (5.7)	16 (5.0)
Sheep	Yankassa	123	12 (9.6)	12 (9.6)
	Balami	95	2 (2.1)	0 (0.0)
	Uda	82	4 (4.9)	4 (4.9)
	Total	300	18 (6.0)	16 (5.3)
Goats	Borno white	120	23 (19.2)	21 (17.5)
	Sokoto red	98	9 (9.2)	9 (9.2)
	Kano brown	182	24 (13.2)	22 (12.1)
	Total	400	56 (14.0)	52 (13.0)
Gross total		1018	92 (9.0)	84 (8.3)

CONCLUSION

In conclusion, this study has confirmed that brucellosis is still endemic among the slaughtered animals in the study area and the prevalence is on the increase especially among the small ruminants. The implication of this is that more animals and human populace are at risk of acquiring the disease through contact with infected materials and consumption of infected animal products (meat and milk) especially those in meat industry and Veterinarians. The high prevalence of the disease especially in small ruminants which serve as the major source of meat in the study area and elsewhere in the country lend credence to call by earlier authors that National Brucellosis Control Programme should be instituted by Nigerian government.

REFERENCES

Ajogi, I., Akinwunmi, J. A., Esuruoso, G. O. and Lamorde, G. A. (1998). Settling the nomads in Wase-Zange grazing reserves in the Sudan savannah zone of Nigeria III: Estimated financial losses due to bovine brucellosis. *Nig. Vet. J*. 19, 86-94.

Alton, G. G., Jones, L. M and Pietx, D. E. (1975). Laboratory techniques in Brucellosis. Second ed. FAO/WHO, Geneva, Monograph Series No. 55.

Bale, J. O., Nuru S. and Addo, P. B. (1982). Serological study of sheep and goats brucellosis in Northern Nigeria. *Bull. Anim. Hlth. Prod. Afr*. 30(1), 73-79.

Bekele, T., Kasali, O. B. (1990). Brucellosis in sheep and goats in central Ethiopia. *Bull. Anim. Hlth. Prod. Afr*. 38, 23-25.

Blasco, J. M., B. Garin-Bastuji, C. M. Marin, G. Gerbier, J. Fanlo, M. P. Jimmenez de Bagues, and C. Cau. (1994). Efficacy of different rose bengal and complement fixation antigens for the diagnosis of *Brucella melitensis* infection in sheep and goats. *Vet. Rec*. 134, 415-420.

Bourn, D., Wint, W., Blend, R. and Wolley, E. (1984). Nigerian livestock resource survey. *Wrld Anim. Rev. FAO* 78(1), 49-58.

Brisibe, F., Nawathe D. R. and Bot C. J. (1996). Sheep and goat brucellosis in Borno and Yobe States of arid northern Nigeria. J. Small Rum. Res. 20, 83-85.

Cadmus, S. I. B., Ijagbone, I. F., Oputa, H. E, Adesokan, H. K. and Stack J. A. (2006). Serological survey of brucellosis in livestock animals and workers in Ibadan, Nigeria. *Afr. J. Biomed. Res*. 9, 165-168.

Chukwu, C. C. (1985). Brucellosis in Africa. Part 1. The prevalence. *Bull. Anim. Hlth. Prod. Afr*. 33, 193-198.

Chukwu, C. C. (1987). Studies on seroprevalence of bovine brucellosis in Enugu and Nsukka, Nigeria. *Zariya Vet.*. 2, 383-387.

Coulibaly, N. D. and Yameogo, K. R. (2000). Prevalence and control of zoonotic diseases: collaboration between public health workers and veterinarians in Burkina Faso. *Acta Trop*. 76, 53-57.

Crawford, R. P., Huber, J. D., Adams B. S. (1990). Epidemiology and surveillance. In: Nielsen K.,Duncan J.R. (Eds.). *Animal Brucellosis*, CRC Press, Boca Raton, USA. pp. 131-151.

Dekeijzer, P. (1981). Brucella biotype in BelgiD. *Landbouwtijdschrift* 34, 1513-1520.

Domenech, J., Corbel, P., Thomas, E. L. M. J. and Lucet, P. (1983). Bovine brucellosis in central Africa. VI. Identification and typing of isolated strains in Chad and Cameroon. *Rev. Elev. Med. Vet. Pays Trop*. 36, 19-25.

Domingo, A.M. (2000). Current status of some zoonoses in Togo. *Acta Trop*. 76, 65-69.

El-Ansary E. H., Mohammed B. A., Hammad A. R. and Karom A. G. (2001). Brucellosis among animals and human contacts in eastern Sudan. *Saudi Med. J*. 22, 577-579.

Falade, S. and Shonekan A. O. (1981). A serological survey of *Brucella abortus* infection in Nigerian sheep. *Nig. Vet. J*. 2, 50-52.

Glosser, J. W (1972). Comments on abattoir-associated brucellosis. *J. Am. Vet. Med. Assoc*. 160, 643- 644.

Ishola, O. O. and Ogundipe, G. A. T. (2001). Seroprevalence of brucellosis in trade cattle slaughtered in Ibadan, Nigeria. *Trop. Vet*. 19, 17-20.

James D. Geraint (1990). A mimic of sarcoidosis: Brucellosis. Editorial . *Sarcoidosis* 7, 87- 88.

Jiwa, S. F. H., Kazwala, R. R., Tngaraza, R., Kimera, S. I. and Kalaye, W. (1996). Bovine serum agglutination testprevalence and breed disposition according to prevalent management systems in the Lake Victoria zone of Tanzania. *Prev. Vet. Med*. 26, 341-346.

Kabagambe, E. K., Elzer, P. H., Geaghan, J. P. and Scholl, D. T. (2001). Risk factors for *Brucella* seropositivity in goat herds in eastern and western Uganda. *Prev. Vet. Med*. 52, 91-108.

Kadohira, M., McDermott, J. J., Shoukri, M. M. and Kyule, M. N. (1997). Variation in the prevalence of antibodies to *Brucella* infection in cattle by farm, area and district in Kenya. *Epidemiol. Infect*. 118, 35-41.

Kubuafor, D. K., Awumbila, B. and Akanmori, B. D. (2000). Seroprevalence of brucellosis in cattle in the Akwapim-South district of Ghana: Public health implications. *Acta Trop*. 76, 45-48.

Madkour, M. M. (1996). Brucellosis. In: Weatherall, D. J., Ledingham, J. G. and Warrell, D. A.(Eds). *Oxford Textbook of Medicine*, 3rd Edition, Oxford: Oxford University Press. pp. 619-623.

Madkour, M. M. (1998). Brucellosis. In: Fauci, A. S., Braunwald, E., Isselbacher, K. J., Wilson, J. D., Martin, J. B., Kasper, D. I., Hauser, S. I. and Longo, D. L. (Eds). *Harrison's Principles of Internal Medicine*, 14th Edition. New York: McGraw Hill: pp. 969-971.

Madkour, M. M. (2001). Brucellosis. In: M. Monir Madkour (Ed) *Madkour's Brucellosis*, 2nd Edition. New York: Springer-Verlag Berlin Heidelberg: p. 1.

Malik G. M. (1997). A clinical study of Brucellosis in adults in the Asir region of Southern Saudi Arabia. *Am. J. Trop. Med. Hyg*. 56, 375-377.

Morgan, W. J. B., and R. A. Richards. (1974). The diagnosis, control anderadication of bovine brucellosis in Great Britain. *Vet. Rec*. 94**:**510-517.

Mohan K, Makaya P. V., Muvavariwa P, Matope G., mahembe E., Pawandiwa A. (1996). brucellosis surveillance and control in Zimbabwe: bacteriological and serological investigation in dairy herds. Ondersterpoort. *J. Vet. Res*. 63, 47-51.

Nakoune E, Debaere O, koumanda-Kotogne F, Selekon B, Samory F., Talarmin A.(2004). Serological surveillance of Brucellosis and Q fever in cattle in central African Republic. *Acta Trop*. 92,: 147-151.

Nuru, S. and Dennis, S. M. (1975). Serological survey of bovine brucellosis in slaughtered cattle in North Central State of Nigeria. *J. Nig. Vet. Med. Assoc*. 4, 3-8.

Ocholi R. A., Ezeokoli C. D. Akerejola O. O. and Saror D. I. (1996). use of enzyme-linked immunosorbent assay for screening cattle for Brucella antibodies in Nigeria. *Vet. Qrt*. 18(1), 22-24.

Ogundipe, G. A. T., Oyeyemi, M. O. and Ijagbone, I. F. (1994). Serolo-prevalence of *Brucella abortus* agglutinins in slaughtered cattle in Ibadan. *Trop. Vet*. 12, 158-161.

Okoh, A. E. J. (1980). Abortion in sheep near Kano, Nigeria. *J. Trop. Anim. Hlth. Prod*. 10, 219.

Refai M., (2002). Incidence and control of brucellosis in the Near East region, Vet. Microbiol. 90: 81–110.

Reichel, R., Nel, J. R., Emslie, R. and Bishop, G. C. (1996). *Brucella melitensis* biotype 1 outbreak in goats in northern Kwa Zulu-Natal. *Onderstepoort J. Vet. Res*. 63, 183-185.

Schelling E, Diguimbaye C, Daoud S., Nicolet J. Boerlin P, Tanner M, Zinsstag J. (2003). Brucellosis and Q fever

seroprevalence of normadic pastoralists and their livestock in Chad. *Prev. Vet. Med.* 61, 279-293.
Schnurrenberger, P. R. Walker J. F. and Martin, R. L. (1975). Brucella infections in Illinois veterinarians. *J. Am. Vet. Med. Assoc*. 167, 1084-1089.
Thapar M. K. and Young E. J. (1986). Urban outbreak of goat cheese brucellosis. *Paed. Infec. Dis*. 5, 640-643.
Tounkara K, Maiga S., Traore A. Seek B. M., Akakpo A. J. (1994). Epidemiology of bovine brucellosis in Mali : Serologic investigation and initial isolation of strains of *Brucella arbortus*. *Rev. Sci. Technol*. 13, 777-786.
Turkson, P. K., Boadu, D. Q. (1992). Epidemiology of bovine brucellosis in the coastal savanna zone of Ghana. *Acta Trop*. 52, 39-43.
Zowghi E, Ebadi A (1985). Naturally occurring Brucella melitensis infection in cattle in Iran. Revue Scientifique et Technique, Office International des ‘pizooties, 4(4):811-814; 8 ref.
Zowghi E, Ebadi A (1988). Abortion due to Brucella abortus in sheep in Iran. Revue Scientifique et Technique, Office International des ‘pizooties, 7(2):379-382; 11 ref.