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Neospora caninum Infection in Nigeria: Evidence of Occurrence in Imported and Native Breeds of Cattle

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SUMMARY

***Neospora caninum* is a protozoan parasite causing significant economic losses due to abortions, birth of weak calves, fertility problems, reduced milk production and increased culling. The objective of this study was to investigate the presence of *Neospora caninum* in cattle imported to Nigeria for dairy purpose and also in the native breeds through the detection of antibodies (IgG) by Enzyme linked immunosorbent assay. Serum samples were collected from 600 cattle (100 Friesian and 500 native) in Nigeria. The seroprevalence of antibodies to *N. caninum* was 4% and 2.8% in the imported and native breeds respectively. This study provides the first serological evidence of the presence of *N. caninum* infection in both imported and native breeds of cattle in Nigeria. While more herd-based sero-epidemiological studies are needed to ascertain the extent of the infection in Nigeria, it is important to screen cattle for neosporosis before importation. The disease should be considered as a differential diagnosis in all cases of abortion in cattle.**

KEY WORDS: *Neospora caninum*; Nigeria; abortion; Friesian cattle; native cattle.

INTRODUCTION

Neospora caninum the cause of neosporosis primarily in dogs and cattle, was first described in 1988 as a protozoan parasite morphologically similar to *Toxoplasma gondii* but with difference in biology (Dubey *et al.*, 1988). It is considered as the most important cause of bovine abortion worldwide (Dubey, 1999) and several studies have demonstrated that a wide range of domestic and wild animals have been exposed to it with viable parasite isolated from only a few hosts (cattle, sheep, water buffalo, dog, horse, bison, white-tailed deer) (Dubey and Schares, 2011). The domestic dog and Australian dingo (both *Canis domesticus*) and the coyote (*Canis latrans*) have been experimentally demonstrated as the definitive hosts for *N. caninum* (McAllister *et al.*, 1998; Gondim *et al.*, 2004; King *et al.*, 2010).

Post-natal ingestion of oocysts and vertical transmission from the dam to the fetus are the only demonstrated modes of transmission in cattle (Dubey and Schares, 2011) while canids are the only known source of post-natal transmission of *N. caninum* to cattle and other intermediate hosts because they shed the oocysts in their feces after ingestion of infected tissues (McAllister *et al.*, 1998). Transplacental transmission can occur in post-natally acquired infections by ingestion of oocysts (exogenous) or reactivation of

infection in a chronically infected cow (endogenous) and the rate of transmission may differ in these two scenarios (Williams *et al.*, 2009).

The clinical consequences of neosporosis include abortion of the foetus, birth of a weak calf sometimes showing neurological clinical signs or birth of a clinically normal but persistently infected calf (Dubey, 1999). The disease is also associated with significant economic losses that include direct costs associated with reproductive failure and, fetal loss and indirect costs such as seeking professional help and expenses associated with establishing a diagnosis, rebreeding, possible loss of milk yield, and replacement costs if cows are culled (Dubey and Schares, 2011).

Several reports showed that bovine neosporosis is a common problem occurring in diary herds worldwide with variations in prevalence within and among countries, and also between beef and dairy cattle (Dubey and Schares, 2011). There are also evidences suggesting that the infection rate differs considerably among cattle breeds (Munhoz *et al.*, 2006; Armengol *et al.*, 2007; Duong *et al.*, 2008). In addition, it has been reported that there is higher prevalence of *N. caninum* infection in cattle imported for dairy purposes than the local breed cattle in Turkey (Akca *et al.*, 2005; Duong *et al.* 2008).

In Nigeria, efforts are being made to improve breed quality and availability of dairy products through the importation of foreign breeds of cattle from countries where intensive dairy farming is practiced. However, there is no published study on the occurence of *N. caninum* infection in both imported and native cattle breeds. The present work is therefore aimed at investigating the occurrence of antibodies to *N. caninum* in imported and native breeds of cattle in Nigeria.

MATERIALS and METHODS

Animals

For this study, 100 imported, adult (> 1year old) Friesian cattle located in a dairy farm in northern Nigeria and 500 native breed cattle belonging to 6 breeds and brought from 14 Nigerian states for slaughter at the Ibadan municipal abattoir, southwestern Nigeria, were used.

Sample collection and storage

Blood samples were obtained into sterile tubes from the jugular vein of the Friesian cattle and those from the native cattle were taken during slaughter. Collected blood samples were left at room temperature for 3 hours, after which the sera were harvested and stored at -20°C until analysed.

Serological assay

The samples were tested for the presence of (IgG) antibodies to *N. caninum* using a commercially available *N. caninum* ELISA kit (Herdcheck™, IDEXX Laboratories, Westbrook, ME, USA). The test was carried out according to the manufacturer's instruction. Sera were diluted 1:100 and investigated for antibody presence. The presence or absence of antibody was determined by calculating the sample: positive ratio (S/P ratio) for each sample. S/P ratios > 0.5 and < 0.5 were considered positive and negative, respectively.

Statistical analysis

Variables were analyzed by Fisher exact test and Chi-square test using the GRAPHPAD PRISM 5.01 (GraphPad Software, La Jalla, CA, USA). Association among variables and occurrence of seropositives were estimated from values obtained by the odds ratio (OR) at 95% confidence interval while P-values < 0.05 were considered significant.

RESULTS

Samples from Friesian cattle

The serological analysis showed that 4 (4.0%) samples obtained from the Friesian cattle were

positive for *Neospora caninum* antibodies. The distribution of the positive samples among sexes was 4.6% (3/65) and 2.9% (1/35) for female and male cattle respectively (Table 1).

Table 1: Distribution of antibodies to N. caninum in blood obtained from Friesian cattle

Sex	Total Tested	Positive	% Positive
Female	65	3	4.6
Male	35	1	2.9
Total	**100**	**4**	**4**

Samples from Native cattle

The overall frequency of *N. caninum* antibodies found in the native breed cattle was 2.8%. Antibodies were detected in Sokoto Gudali (1%), Red Bororo (0.8%), White Fulani (0.8%) and Kuri (0.2%). Sera obtained from N'dama and mixed breeds of cattle were negative (Table 2). The frequency of antibodies to *N. caninum* among the sexes showed that 3.0% and 2.0% of the female and male cattle were positive respectively. Positive sera were

DISCUSSION

The increase in importation of foreign breeds

Table 2: Distribution of antibodies to *N. caninum* in blood from native breeds of cattle

Variables	Number Tested	Positive	% Positive	OR (95% CI)	*P* Value
Cattle	**500**	**14**	**2.8**		
Sex					
Female	401	12	3.0	1.50 (0.3 – 6.8)	1.000[a]
Male	99	2	2.0		
Native breeds					
Kuri	44	1	2.3	NC	0.938[b]
Mixed	26	0	0		
N'dama	10	0	0		
Red Bororo	120	4	3.3		
Sokoto Gudali	161	5	3.1		
White Fulani	139	4	2.9		
State of Origin					
Bauchi	11	0	0	NC	0.283[b]
Borno	23	1	4.3		
Kaduna	4	0	0		
Kano	22	1	4.5		
Katsina	42	4	9.2		
Kebbi	71	4	5.6		
Kogi	4	0	0		
Nasarawa	22	1	4.5		
Niger	128	3	2.3		
Ogun	7	0	0		
Oyo	24	0	0		
Sokoto	106	0	0		
Yobe	31	0	0		
Zamfara	5	0	0		

[a] Fisher Exact, [b] Chi-square, OR = odds ratio, CI = Confidence interval, NC = Not calculated

of cattle to developing countries for milk production and breeding has made it important to monitor the diseases associated with intensive dairy farming. This study identified antibodies to *N. caninum* infection in both imported and local breed cattle for the first time in Nigeria. The findings are similar to the nationwide survey of dairy cattle in Japan with a prevalence of 5.7% (Koiwai *et al.*, 2006) but lower than the prevalence of 32% obtained in Iran (Youssefi *et al.*, 2009), 27.7% in Western Romania (Imre *et al.*, 2011) and 17.9% in Senegal (Kamga-Waladjo *et al.*, 2010). The seroprevalence of *N. caninum* has been shown to vary among and within countries (Dubey and Schares, 2011).

A higher prevalence of *N. caninum* antibodies was obtained in the foreign breed of cattle than in the native breeds. This finding is similar to a previous study in Turkey where *N. caninum* antibodies were found in the foreign breeds and absent in the native breeds (Akca *et al.*, 2005). Although both breeds cannot be statistically compared giving the difference in sampling method and other limitations in the present study, more herd-based epidemiological studies are needed to determine the prevalence of neosporosis in Nigeria.

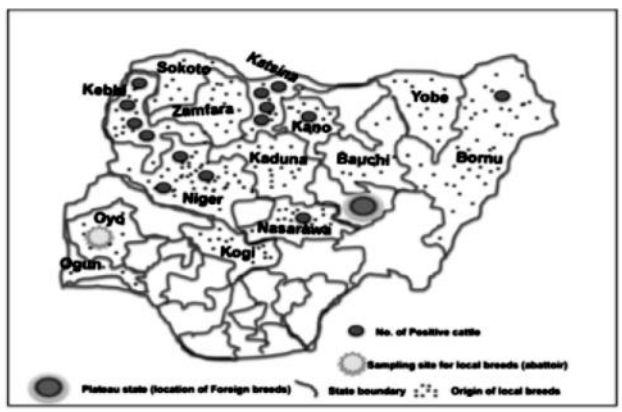
The detection of antibodies to *N. caninum* in imported Friesian cattle underscores the need for screening of all cattle imported into Nigeria for neosporosis at point of entry; since *N. caninum* is now considered as one of the most efficiently transplacentally- transmitted parasites among all known microbes in cattle (Dubey and *Schares*, 2011). Based on the results of this study, the management of the dairy farm that own the Friesian cattle were advised to discontinue the use of animals that gave positive results for breeding and to incorporate screening for *N. caninum* infection into their health management programme.

Furthermore, the 2.8% frequency of detection of *N. caninum* antibodies among animals sampled at the abattoir in this study suggests that the native breeds of cattle in Nigeria are exposed to Neosporosis, although the extent of exposure and the importance of this abortifacient infection cannot be determined until extensive herd-based studies are carried out and attempts at isolation of *N. caninum* are made from cases of bovine abortions.

Additionally, this study suggests that neosporosis should henceforth be considered as a differential diagnosis in cases involving abortion and birth of weak calves showing neurological signs (Dubey *et al.*, 1988).

The distribution of *N. caninum* antibodies by the state of origin of native cattle seems to present a pattern that showed that the positive native cattle were mainly from the northwestern states of Nigeria (Figure 1). Herd-based and risk factors studies are needed to ascertain the true status of neosporosis in this region, since it is difficult to ascertain if the cattle transported to the abattoir from a particular state was not acquired from another state.

Figure 1.
Distribution of *Neospora caninum* positive sera in Nigeria showing the origin of cattle and the sampling site



Furthermore, while the imported cattle could have been infected from their country of origin, the sources of infection for the native breeds are not known although a probable source could be the ingestion of pasture contaminated with *N. caninum* oocysts from farm or herd dogs.

In conclusion, the detection of antibodies to *N. caninum* in Nigerian native cattle and those imported for dairy purposes necessitates the implementation of appropriate prevention and control measures by farmers and proper screening of cattle at the national port of entry.

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