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Point Prevalence of *Cryptosporidium* Oocyst in Calves Grazing along River Rima Bank in Sokoto, Nigeria

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Abstract: The present study was conducted to investigate the point prevalence of *Cryptosporidium* oocysts infection in calves grazing along the bank of Rima River Sokoto in October 2011. The river bank is a converging zone for domestic animals reared in different quarters of the town and the surrounding settlements. A total number of 2,959 cattle were enumerated out of which 147 (4.97%) were calves. Faecal samples were collected from 100 (68.02%) calves by convenient sampling technique. Formol-Ether sedimentation and modified Ziehl-Neelsen staining techniques were used to identify the *Cryptosporidium* oocysts in the faecal samples. Faecal consistency was also used to identify diarrhoeic and non-diarrhoeic calves. *Cryptosporidium* oocysts were identified in 33(33.0%) of the calves examined. The detection rate was higher among the male calves (38.46%) than females while the Rahaji breed had the highest prevalence of 62.5%. A total of 6 (18.18%) among the positive cases were diarrhoeic. The differences in prevalence based on sex, breeds and presence of diarrhoea were not statistically significant. Calves may become sources of *Cryptosporidia* infection to man and other animals in the study area through unrestricted movements and interactions with the environment.

Key words: Calves, *Cryptosporidium*, diarrhoea, rahaji, Rima river, Sokoto

INTRODUCTION

Cryptosporidiosis is an infection caused by the protozoan *Cryptosporidium* which is characterized by acute onset of gastroenteritis (Atherton *et al*., 1995) and has been identified as the cause of many outbreaks of diarrhoea in humans and animals all over the world (Fayer *et al*., 2000; Fayer, 2004). Cryptosporidiosis has been reported to affect mainly very young and immunocompromised animals. Calves and lambs of 1 to 3 weeks of age appear to be most susceptible (Ayeni *et al*., 1985; Colville and Berryhill, 2007). *Cryptosporidium* has been found in 2.4 to 100% of calves and cattle (Castro-Hermida *et al*., 2002), 1.45 to 59% of lamb and sheep (Nouri and Karami, 1991; Causape *et al*., 2002) and 4.6 to 6.4% of kids and goats (Gorman *et al*., 1990; Minas *et al*., 1994). In Nigeria, Ayimmode and Fagbemi (2010), obtained 28.1% (n = 96) from 7-12 months old calves and 27.3% (n = 84) from calves less than 6 months in a south west state.

Like in animals, immunocompromised and young humans suffers severe and life threatening, profuse, intractable diarrhoea with *Cryptosporidium* species (Smith, 1990), particularly people living with HIV/AIDS (Radostis *et al*., 2004). Animal to human transmission has been established (Reynoldson, 1999) and importance of water as a route of transmission has been increasingly recognised (Casemore, 1990; Anonymous, 1990). Contact with contaminated drinking and recreational waters with humans or animal faeces are major sources of waterborne zoonotic transmission. The presence of *Cryptosporidium parvum* in almost all environmental waters has been investigated and documented (Smith and Rose, 1998). Cattle manure is a recognized source of *Cryptosporidium parvum* oocysts (Hiepe and Buchwalder, 1991; Pell, 1997). Manure management or treatment strategies tends to minimize oocysts viability and transportation to water. If followed by periods of rainfall, improper disposal of farmyard manure, faeces and other contaminated waste in dump sites can lead to contamination of water with *Cryptosporidium* oocyst (OIE, 2005).

It was observed that the presence of animals along the Rima River coupled with the process of grazing and indiscriminate deposition of animal faeces along the river bank can lead to environmental and water pollution with

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microorganism. Therefore, the main objectives of the present study was to determine the prevalence of cryptosporidiosis in calves grazing along Rima River bank and to examine the potential risk posed to animals and man by consumption of water from the river.

MATERIALS AND METHODS

The Rima River is located north of Sokoto metropolis and it is a major source of raw water supply to the Sokoto main water treatment plant that is situated at a short distance to the river bank. The river also serves as source of irrigation for vegetable farms and converging area for domestic animals from different households and surrounding settlements. The animals are collected from different households in the morning by paid herders, move on hoof towards the river where they are grazed and watered till evening when they shall be returned to their respective homes. The team moved in on the 22nd October, 2011, enumerated the cattle herds present at that point in time, identified the calves and selected the sampled calves by convenient sampling technique based on cooperation from the herders (Cameron, 1999).

Faecal sample were collected per rectum of calves with gloved hand, put in sterile bottles and transported to the Veterinary Public Health Laboratory, Usmanu Danfodiyo University, Sokoto. The faecal matter were processed by formo-ether sedimentation technique and identification of the oocysts by modified Ziehl-Neelsen (mZN) staining as described by OIE (2005) and then examined for oocysts under the microscope using×40 object (low power) magnification (Cheesebrough, 1999). During faecal collection the sexes of the animal were determined using external genitalia, age estimation by asking for the calving date and confirmed by the dentition, breeds through their external body features and presence of diarrhoea was recorded. Detection rate(s) of *Cryptosporidium* oocysts in each sample were compared by sex, age, breeds and presence or absence of diarrhoea, using Chi-square test at 5% level of significance.

RESULTS

In this study, no significant association ($p>0.05$) exist between the three variables analysed (sex, age, breeds and presence or absence of diarrhoea) in calves. Out of 100 bovine faecal samples examined, 33 (33%) were positive for *Cryptosporidium* oocysts. Oocysts detection rate of 38.46 and 31.08% were obtained for male and female calves, respectively (Table 1).

Table 1: Prevalence of *Cryptosporidium* oocysts in calves in relation to sex

Sex	No. of sample examined	No. of samples positive	Prevalence(%)
Male	26	10	38.46
Female	74	23	31.03
Total	100	33	33.00

p-value: 0.491, χ^2 (DF), 0.474(1)

Table 2: Prevalence of *Cryptosporidium* oocysts in relation to presence or absence of diarrhoea

Diarrheic status	Total sample	Positive	Prevalence(%)
Diarrheic	26	6	23.07
Non diarrheic	74	27	36.48
Total	100	33	33.00

p-value: 0.221, χ^2 (DF), 1.565(1)

Table 3: Prevalence of *Cryptosporidium* oocysts in different breeds identified

Breeds	Total sample	Positive	Prevalence(%)
Cross	42	15	35.71
Rahaji	26	10	62.50
Sokoto gudali	24	6	25.00
White fulani	8	2	25.00
Total	100	33	33.00

p-value: 0.702, χ^2 (DF), 1.417(3)

Of the total 100 samples collected, 26 (26%) were diarrheic, out of which, 6 (23.07%) were positive for infection, while out of 74 non diarrheic samples, 27 (36.48%) were positive for *Cryptosporidium* oocysts (Table 2).

Four different breeds were identified during sampling and these include Cross, Rahaji, Sokoto Gudali and White Fulani. Infection rate was highest for Rahaji breeds (62.5%) and lowest among Sokoto Gudali and White Fulani (25%) (Table 3).

DISCUSSION

The faecal carriage of *Cryptosporidium* oocysts in calves in this study is relatively high and similar to some reports from Nigeria, Africa and rest of the world (Joachim *et al*., 2003; Faleke *et al*., 2006; Ayinmode and Fagbemi, 2010). The high prevalence may be attributed to wetness and high humidity along the river bank which can encourage oocysts survival and increase their viability when present. The finding of higher prevalence in males agreed with the report of Maikai *et al.* (2009), this may be due to the tendency of male animals to disperse to other herds from different cattle concentration. In this report prevalence of *Cryptosporidium* oocysts was higher in non diarrheic calves and this concurs with the findings of Ayinmode and Fagbemi (2010). This could be an indication of ongoing infections. It has been reported that presence of microorganisms such as *Salmonella*, *Campylobacter*, *Yersinia*, *Escherichia coli, rotavirus*, helminthes and coccidia are highly associated with diarrhoea in livestock and they may occur as mixed infection (Adesiyun and Kaminjolo, 1994). Detection of

Cryptosporidium oocysts among calves in this study call for concern as the infected calves mingled with non infected animals and also interacts with man in their various households. This can lead to spread of infection in man and animals. The faecal droppings can also contaminate the environment and the water body.

CONCLUSION

This study aimed at investigating the presence of *Cryptosporidium parvum* in cattle calves that graze along Rima River bank in Sokoto and to evaluate the potential risk animals and man are exposed to by consuming water from the river. Calves may become sources of *Cryptosporidia* infection to man and other animals in the study area through unrestricted movements and interactions with the environment.

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