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PREVALENCE OF *CRYPTOSPORIDIUM PARVUM* IN DUNG COLLECTED FROM CATTLE IN BAMENDA, NORTHWEST REGION OF CAMEROON

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Abstract

The dynamic of Cryptosporidia parvum and its zoonotic potentials have not been established in the Northwest Region of Cameroon, which is an important watershed in Cameroon with a lot of cattle grazing at free range.

The aim of this study was to identify Cryptosporidia oocysts and other intestinal parasites in cattle from the 6 out of the 7 divisions that make up the Northwest Region of Cameroon. Single stool samples were randomly collected from 60 cattle (30 diarrhoeic and 30 non-diarrhoeic) immediately the cattle passed dung. Dungs were examined for intestinal parasites using standard techniques (Formalin-ether sedimentation method and Modified Kinyoun's acid-fast stain).

Out of the 60 dung samples examined, 34 were found to be positive with one or more parasites, giving an overall prevalence of 56.67%. Fasciola species recorded the highest prevalence 10(16.67%), followed by Cryptosporidium parvum 07(11.7 Fasciola spp has the highest prevalence 7(23.33%), followed by Cryptosporidium parvum 5(16.67%), in diarrhoeic dung. For non-diarrhoeic dung Fasciola spp 2(6.67% and Cryptosporidium parvum is 2(6.67) that were the same.Cryptosporidium parvum is common in the North West Region of Cameroon and can easily contaminate the environment leading to human infections.

Introduction

Clinical reports associating *Cryptosporidium* infection with diarrhoea in cattle was first done in 1971 [1]. It was not until 1980 [2] when this parasite was asserted as the primary cause of diarrhoea, after the study of an outbreak of neonatal diarrhoea in cattle. [3,4]. Cattle management method often used in the Bamenda Highland is free range grazing practice by the Fulani pastoralists. A study in Jakiri- Cameroon[5] revealed that, ruminants confined in paddocks recorded lower prevalence rates of intestinal parasite infection compared to free range grazers and tethered animals. However, *Cryptosporidium parvum* was not considered as a parasite that can cause diseases in livestock. Food grown in soil fertilized with cattle manure could also be considered a potential source of infection [6]. Till date, Cryptosporidiosis in cattle is not yet considered as a bane of livestock production in Cameroon despite the fact that it has been reported from different parts of the world with approximately 45.5% incidence in USA, 24.5% in UK, 26% in USSR, 40% in Germany and 27% in Hungary [7]. In India a study revealed mortality rate of up to 35percent in calves due to cryptosporidiosis [8]. In Nigeria an overall prevalence of infection with *Cryptospodium spp* of 23.4% (95/406), in Oyo State was observed [9]. Most of the cases were in asymptomatic cattle that could serve as reservoirs for the zoonotic infection in humans.

Cryptosporidium parvum is major a species having zoonotic potential. However, other species including *Cryptosporidium bovis*, *Cryptosporidium andersoni and Cryptosporidium ryanae* have been isolated from infected cattle [10, 11].
Cryptosporidiosis is an infection caused by an apicomplexan protozoan known as *Cryptosporidia*. *Cryptosporidia spp* common parasites of vertebrates have recently attracted increasing interest due to several serious waterborne outbreaks, and the life-threatening nature of infection in immunocompromised patients, children, the elderly, and patients on chemotherapy, pregnant women; and also the realization of economic losses caused by these pathogens in livestock. It is a common enteric pathogen in humans and domestic animals worldwide with a very low infective dose of one to ten ooysts(Pereira[12]. The sporulated ooysts are immediately infectious when excreted in faeces as there is no intermediate host.
Cattle are reared throughout Cameroon but the major production areas are in the West and North West Regions and from the Adamawa Province [13]. The cattle are transported on foot to the cattle market and the dung they pass along the road is likely to contaminate the environment and the oocysts possibly end up in streams after torrential rains.
The aim of this study was to identify *Cryptosporidiosis parvum* and other intestinal parasites in cattle being transported to the main cattle market in Bamenda, the Northwest Regional headquarter

Materials and methods

Study area

Bamenda, the North West Regional capital**:** The Western High Plateau or Western Highlands, or Bamenda Grassfields is a region of Cameroon characterized by high relief, cool temperatures, heavy torrential rainfall, and savanna vegetation.
The area experiences two major seasons: A long, wet season of nine months, and a short, dry season of three months. Average rainfall per year ranges from 1,000 mm to 2,000 mm. Sudan savanna forms the dominant vegetation. This consists of grassfields—leading to the name *Bamenda grassfields* around the city of Bamenda—and short shrubs and trees that shed their foliage during the dry season as a defence against brush fires and dry weather.

With this climate, topography and vegetation, the North West Region is an excellent zone for animal husbandry. [13]There exist the extensive, semi-intensive and intensive types of animal husbandry which involve large ruminants (cattle), small ruminants (goats and sheep), pigs, poultry and non-conventional livestock. A lot of the extensive cattle production by free ranging is practiced in Donga Mantung, Menchum, Bui, Boyo, Momo and Mezam Divisions [14]. The Ndop plain in Ngoketunjia Division serves as an important transhumance zone for the cattle population from neighbouring Divisions and the West Region.

Farming is done along the streams or swamps rice in the plains and gardens, irrigated with the water from the streams [15].
Bamenda is situated between longitude $10^0.08'$ to $10^0.12'$ E and latitude $5^0.55'$ to $6^000'$ N. The city covers a surface area of 71.23 square kilometers. Bamenda is the regional head quarters of the North West Region of Cameroon. Urbanization has had severe impacts on the hydrology of Bamenda through the creation of roads, settlements and the generation and the dumping of wastes in rivers and streams. Three broad agricultural land use systems – crop based farming, pure pastoralism and mixed crop-livestock – are practiced in the study area. In these systems, traditional farming practices are a combination of crop and small livestock husbandry (pigs, goats, sheep, rabbits) for the native crop farmers, cattle and limited crop production for Mbororo/Hausa/Fulani non- natives, and pure crop and/or livestock farms for commercial urban dwellers. In the dry season, water is scarce and people have to make use of water from highly polluted streams.

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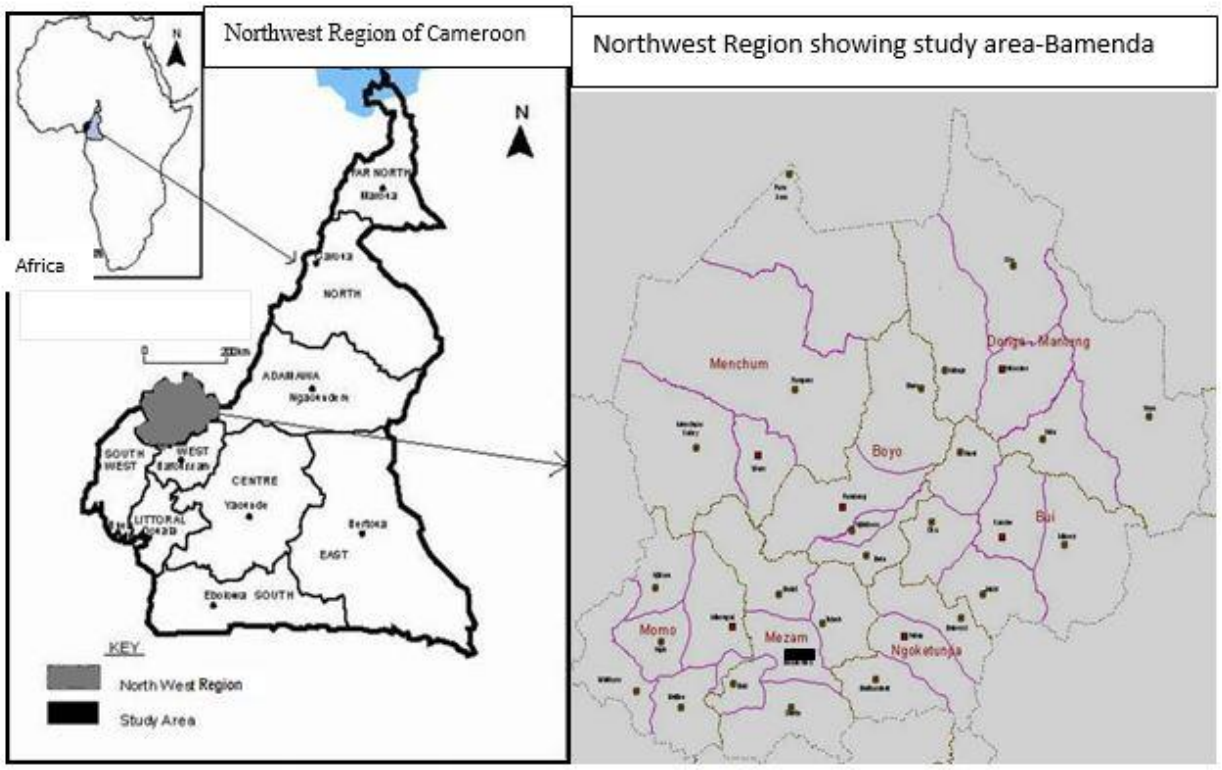

Figure. 1. ***Cameroon Map showing the study area, Bamenda.*** Source: North West Regional master plan for sustainable development 2001[19]

River Mezam is the main river which drains Bamenda. The hydrography presents a characteristic dendritic drainage pattern. This study will provide adequate information that the government should use to protect and advice the inhabitants on water use and prevention of waterborne infections. Overgrazing, the seasonality of streams and scarcity of potable water in the dry season are just part of the chain of problems originating from the degradation of the watershed due to population pressure. Watersheds are generally considered as points of development especially in countries which rely on water dependent activities [16].

Method of sample (Dung) collection:
A month before sample collection was to commence a visit was paid to the abattoir to sensitize the director and the cattle farmers about the importance of the study. The dung was collected from cattle being transported from the divisions of the Northwest Region to the main cattle market, near the abattoir in Bamenda metropolis.
Fresh dung was collected from cattle being transported to Bamenda Central cattle market in the month of December 2014. The samples were randomly collected from the anal region of the cattle with the assistance of the herdsmen of which a total of 60 samples were collected for analysis. 60 samples (30 diarrhoeic and 30 non diarrhoiec) were collected from each of the 6 routes that the cattlemen used in transporting the cattle to the market. Dung was collected by scooping with plastiques spoons into a well labeled dry sterile universal plastic bottle following defaecation. The collected samples were immediately transported to PRF for analysis or refrigeration.

Sample processing and staining
The Formol-ether sedimentation method was used to recover oocysts[17]. This method is recommended for use because it is rapid and can be used to concentrate a wide range of faecal parasites from fresh or preserved faeces with minimum damage to their morphology. when concentrating the oocysts of coccidian e.g. **(***Cryptosporidia spp*), an additional centrifugation stage is required to yield more oocysts.[17] The Modified Kinyoun's Acid-Fast Stain (Cold) was used [18] to stain the parasites.

Identification of the Parasites

This was based on the microscopic and morphological appearance of the eggs encountered during examination of each sample under magnification 10X and 40X objectives. Microscopic appearance of the eggs was then carefully compared with those in standard texts, literature and micrographs for proper identification by two Laboratorians. Prevalence was expressed as the percentage of cattle infected. Stained slides were compared with positive oocysts and identified on the basis of microscopic morphological features [17]. Photographs of oocyst and /or other parasites seen under the Microscope were provided by the Phyto-Biotechnology Research Foundation.

Statistical analysis

Data was entered into Ms Excel® 2003 (Microsoft corporation, USA) and analysis were conducted using SPSS for Windows version 12.0. Prevalence was calculated as a percentage of d/n where d is the number of animals infected and n = Total number of animals examined.

Results

Of the 60 dung samples examined, 34(56.67%) had intestinal parasites detected. Table 1 shows the overall prevalence of different parasites. *Fasciola spp* was the most predominant10 (16.67%), followed by *Cryptosporidium parvum* 7(11.67%).

Fasciola spp has the highest prevalence 7(23.33%), followed by *Cryptosporidium parvum* 5(16.67%), in diarrhoeic dung Table 2. For non-diarrhoeic dung *Fasciola spp* 2(6.67% and *Cryptosporidium parvum* is 2(6.67) that were the same Table. 3.

The prevalence of the *Cryptosporidium spp* determined by microscopy, showed *the distribution in non-diarrhoea and diarrhoea dung samples as* 1:2.5 ratio.

Comparing the prevalence of all microbes present in the overall sample, cryptosporidium is second in prevalence in all samples.

Table 1: ***Overall prevalence of parasites in 60 cattle in Bamenda Central cattle market***

	Identified helminthes/protozoan	**Number of cattle infected**	**Prevalence (%)**
1	*Fasciola spp*	10	16.67
2	*Taenia spp*	06	10.0
3	*Emeria spp*	05	8.33
4	*Strongyloides spp*	02	3.33
5	*Trichostrongylus species*	01	1.67
6	*Cryptosporidium spp*	07	11.67
7	*Trichuria spp*	03	05
	TOTAL	**34**	**56.67**

Table. 2.0 Prevalence of parasites in 30 samples of Diarrhoiec cattle dung

	Identified helminthes/protozoan	**Number of cattle infected**	**Prevalence (%)**
1	*Fasciola hepatica*	07	23.33
2	*Taenia spp*	04	13.33
3	*Emeria spp*	05	16.67
4	*Strongyloides spp*	02	6.67
5	*Trichostrongylus species*	01	3.33
6	*Cryptosporidium spp*	05	16.67
7	*Trichuria spp*	02	6.67
	TOTAL	**26**	**86.67**

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Table. 3.0 Prevalence of parasites in 30 samples of Non-Diarrhoiec cattle dung

	Identified helminthes/protozoan	**Number of cattle infected**	**Prevalence (%)**
1	*Fasciola spp*	**02**	6.67
2	*Taenia spp*	**03**	10
3	*Emeria spp*	**00**	00
4	*Strongyloides spp*	**00**	00
5	*Trichostrongylus species*	**00**	00
6	*Cryptosporidium spp*	**02**	6.67
7	*Trichuria spp*	**01**	3.33
	TOTAL	**08**	**13.33**

Discussion

The purpose of this study was a preliminary attempt to assess the presence and/or prevalence of the parasitic protozoan *Cryptosporidium parvum* in cattle dung. There is lack of data concerning the occurrence of *Crptosporidium parvum* in cattle dung in Cameroon as it is not considered as a bane to animal production. Epidemiological studies of gastrointestinal parasitic infections in ruminants in Cameroon [17] did not include *Cryptosporidium parvum* as a parasite of importance but the overall prevalence of parasites in cattle (56.7 %)). These results coincide with the results of this present study with an overall prevalence of 56.67%). Their results could have been higher if cryptosporidiosis was considered in their study.

The present study has revealed an overall prevalence of 11.67% in cattle which is the main ruminant feeding at free range in our water catchment area. This prevalence is lower than that reported by Adekunle and Fagbemi (2010)[9] who observed an overall prevalence of infection with *Cryptospodium spp* of 23.4% (95/406), in Oyo State. In the USA, USSR, UK, Germany Hungar and India, the results were higher than in Bamenda possibly due to more sensitive methods of identification of oocysts that were employed.

This parasite has with a very low infective dose of one to ten oocysts[12] to elicit an infection. This parasite can be transmitted to man and those with altered immune system it can be fatal.

CONCLUSION

For any sample randomly taken from the overall sample and analyzed, there is a 100% chance that the prevalence of cryptosporidium lie between a value of 6.67(prevalence in non-diarrhea sample) and 16.67 (value in diarrhea sample). Since the infective dose is very low, one to ten ooysts[12], dung should be handled with care to avoid infection.

Cattle are an important source of contamination of the environment with infective stage (oocyst) of *Cryptosporidium parvum*.

Recommendation

State of the art equipment should be used to establish the dynamics of Cryptosporidiosis in the Northwest Region of Cameroon, since it cattle raring areas where the ruminants are grazing at free range. Cattle should be transported to the cattle markets in trucks so that the dung can be collected and properly disposed of.

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Conflicts of interest

The authors declare no conflicts of interest

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