Veterinary Research 5 (3): 59-62, 2012
ISSN: 1993-5412

Epidemiology of Cestodes Infections in Sheep and Goats in Benin

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Abstract: A study was undertaken in order to assess the prevalence and the seasonal variation of cestodes infections in small ruminants of Benin. From December 2010 to November 2011, 756 randomly selected small ruminants (366 sheep and 390 goats) have been slaughtered and autopsied. Surface's muscles, viscera and cavities (abdominal, thoracic and pelvic) have been inspected for recovering cysts (metacestodes) and adult cestodes. In both sheep and goats, two larval cestodes have been found. There were *Cysticercus tenuicollis* and *Cysticercus ovis* with respectively, 55.57 and 3.44% of prevalence. Regarding adult cestodes, only *Moniezia expensa* was diagnosed with an overall prevalence of 29.5%. The whole infections were prevalent all seasons with nevertheless high rates in rainy seasons. The prevalence of cysticercosis was significantly ($p<0.001$) higher in adult animals (37%) than in young (22%). This study reveals that cysticercosis represent an acute problem for animal health and for meat's quality in Benin.

Key words: Epidemiology, cestodes, goats, sheep, Benin

INTRODUCTION

In Benin, the breeding of small ruminants is a common activity conducted in an extensive management system. It is practiced by rural households. Consequently, several programs of rural poverty reduction used to include global improvement of the farming management. Nevertheless, the breeding of small ruminants is traditionally, undertaken in an extensive management system with absolute grazing. Then, they often risk some parasitic problems such as gastrointestinal parasites infections which are responsible for morbidity, mortality and suboptimal production according to several researchers (Barger, 1999; Chiejina, 1986; Larson, 1999; Sykes, 1994). According to Harper and Penzhorn (1999), these parasitic infections represent an impediment for livestock.

Cestodes are an interesting group among several other parasites; since some of them have a potential to infect economically domestic ruminants (Zinsstag *et al*., 1998). Beyond the fact that adult of some genera despoil animals, larvae of other genera cause important meat depreciation putting public health at stake. In Benin, these enemies are well known in consideration of the reports of Salifou. But there is no available occurrence data in fact, parasites control is conducted blindly most of the time with repeated and improper use of anthelminthic chemicals. The current study aimed, on one hand, to reveal the occurrence of cestodes infections in sheep and goats out from different regions in Benin and on the other hand to investigate some possible variations and their influence factors.

MATERIALS AND METHODS

Study area: The investigations were conducted in all the departments of Benin divided into two study areas: Zone A and B (Table 1). This grouping has been established according to climatic characteristics.

Study animals: Between December 2010 and November 2011, 756 post weaning small ruminants (366 sheep and 390 goats) (Table 1) were randomly selected, bought and slaughtered essentially in Cotonou abattoir. Each selected animal was numbered and its origin, species, sex, age, body form and particular signal were noted.

Parasitological methods: Most of the animals were autopsied at Cotonou abattoir. Exceptionally, some others were examined at the purchase place (enclosed villages, animal health distress). First, the carcass and the abdominal, thoracic and pelvic cavities were examined visually and then the gracilis muscle was incised in parallel to the pubic symphisis. The hearts was incised

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Table 1: Study areas and its characteristics

Study areas	Seasons and covered months	Pluviometry (mm year^{-1})	Selected animals
Zone A (5 departments)	A dry season (September to March)	700-1300	137 goats and 257 sheep
Alibori-Borgou	A rainy season (April to August)		
Atacora-Donga and Collines			
Zone B (7 departments)	A short rainy season (September to November)	800-1400	253 goats and 109 sheep
Zou-Mono-Couffo	A long dry season (December to March)		
Atlantique-Littoral	A long rainy season (April to July)		
Oueme-Plateau	A short dry season (August to September)		

once lengthwise through the left ventricle and inter ventricular septum. The muscles of the diaphragm were examined visually. This inspection aimed at finding out the cysts. Following that the small intestines were isolated from the rest of viscera and opened longitudinally. Each adult cestode was then collected with a surgical forceps and preserved in a labelled bottle containing 10% formalin. Finally, all the takings were transferred to laboratory for the diagnosis. The diagnosis criteria were those indicated by Yamaguti (1961) and Soulsby (1982).

Data analysis: The prevalence of larval and adult cestodes infections was calculated by dividing the number of positive subjects by the number of examined animals. Data were entered into a Microsoft Excel spreadsheet. Statistical analysis was performed using STATA 11 Software with the Logistic Regression Model. Descriptive statistics was used to summarize the data. The model was fitted with likely risk factors associated with the cestodes prevalence such as season and host's species, age, sex and origin.

RESULTS AND DISCUSSION

Cysticercus tenuicollis and *Cysticercus ovis* were the two metacestodes detected during the survey with respectively a mean occurrence of 55.57 and 3.44% (Table 2). Whatever the zone infections caused by *C. tenuicollis* were prevalent all months through while *C. ovis* infections were very infrequent (Fig. 1). The animal's origin and age had no significant influence on the occurrence of cysticercosis. Meanwhile, the infection rate was statistically ($p<0.001$) higher in sheep (58.24%) than in goat (53.08%), (Table 2). The highest infection rates were recorded in the very wet months, July and August (Fig. 1). Then, cysts burden was also important about 8±3. The cysts localizations (cavities and organs) in decreasing importance were respectively abdominal cavity (wall intestines, rumen and liver), pelvic cavity (muscles and kidney), thoracic cavity (heart and lung) and surface muscles (thigh).

Concerning adult worms, only *Moniezia expensa* was diagnosed in both sheep and goats. A total of 223 out of 756 (29.50%) animals were infected by *M. expensa* (Table 3). The infection was endemic with a peak (51.61%) in July. Moniezia infection stayed high (beyond 50%) during wet periods corresponding to some rainy months notably from July to October 2011 (Fig. 2). Overall, the infection trend did not differ according to animal origin and age. However, the animal species had been statistically an important risk factor ($p<0.001$). Infection occurrence was higher in sheep, especially in those coming from Zone B (centre and south of Benin) than in goats (Table 3). The parasites burden was of 4±1.23 worms per infected subject.

The overall prevalence of *C. tenuicollis* has been high (55.57%). Other researchers have already reported so worrying rate elsewhere in Africa. Barry reported a rate of 71% in Guinea. Wondimu *et al.* (2011) registered the prevalence of 56.8 and 63.9%, respectively in sheep and goats in Ethiopia. Close to the study zone, lower prevalence was recorded: 30% in goat in Burkina Faso and respectively, 23.3 and 20.97% in sheep and goats of Nigeria (Akinboade and Ajiboye, 1983). The study showed that sheep are more vulnerable than goats. This sheep vulnerability was already observed in India by Pathak and Gaur (1982) but some other observations (Dada and Belino, 1978; Nimbalkar *et al.*, 2011) are at variance with this trend. The season also had significant effect on the infection prevalence. The rate of infections with both *C. tenuicollis and C. ovis* were low in dry seasons. This agrees with literatures. In dry season, the grazing hours is reduced and the chances of contact between host and parasites are proportionally, reduced. In any case, these rates remain very high. Certainly, climate conditions could be involved. But the traditional breeding system, dog's divagation and illegal slaughtering play the greatest role in this infection dynamic. There is a real problem of animal health and production that involved meats quality.

Monieziasis caused by *M. expensa* showed itself very endemic in Benin. The overall prevalence of 29.5% was in agreement with reports from Pawade *et al.* (2011) whom pointed out a Moniezia prevalence of 30% in goat at Sangamner region, Ahmednagar district India. Higher prevalence was recorded elsewhere. Shaikh *et al.* (2011) have reported the rate of 40.34% in goat from Aurangabad India. In Guinea, Barry recorded an infection prevalence

Table 2: Prevalence of *C. teniucollis* and *C. ovis* in small ruminants according to species, age and origin

				Cysticercus teniucollis		*Cysticercus ovis*	
Species	Age	Origin	Examined subjects	Infected subjects	Prevalence (%±SD*)	Infected subjects	Prevalence (%±SD*)
Goat	Old	Zone A	94	55	58.51±0.50	2	2.13±0.15
	Old	Zone B	172	83	48.26±0.50	7	4.07±0.20
	Young	Zone A	43	25	58.14±0.50	0	0.00±0.00
	Young	Zone B	81	44	54.32±0.50	1	1.23±0.11
	Total		390	207	53.08±0.50	10	2.56±0.16
Sheep	Old	Zone A	173	104	60.12±0.49	12	6.94±0.25
	Old	Zone B	65	41	63.08±0.49	3	4.62±0.21
	Young	Zone A	84	41	48.81±0.50	1	1.19±0.11
	Young	Zone B	44	26	61.90±0.49	0	0.00±0.00
	Total		366	212	58.24±0.49	16	4.37±0.20
Grand total			756	419	55.57±0.50	26	3.44±0.18

SD = Standard Deviation

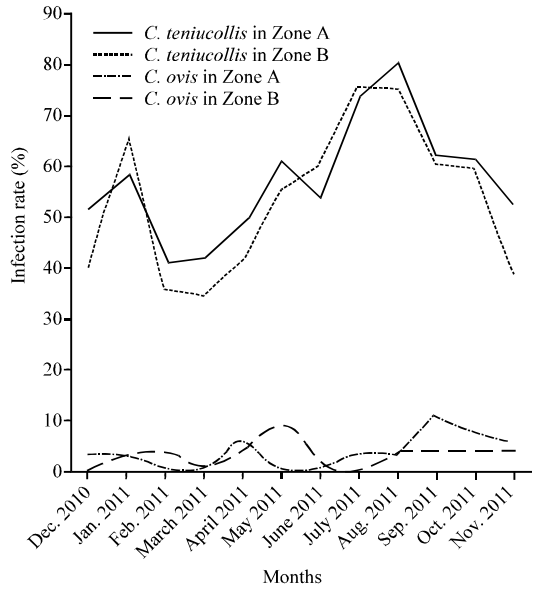

Fig. 1: Monthly cysticercosis prevalence in small ruminants according to study zones

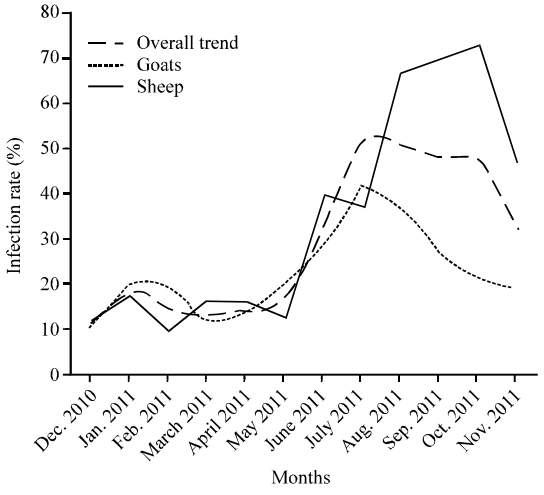

Fig. 2: Monthly monieziasis prevalence in small ruminants

Table 3: Prevalence of *Moniezia expensa* infections in small ruminants according to species, age and origin

Species	Age	Origin	Examined subjects	Infected subjects	Mean prevalence (%)	SD
Goat	Old	Zone A	94	17	18.09	0.39
	Old	Zone B	172	38	22.09	0.42
	Young	Zone A	43	9	20.93	0.41
	Young	Zone B	81	25	30.86	0.46
	Total		390	89	22.82	0.42
Sheep	Old	Zone A	173	58	33.53	0.47
	Old	Zone B	65	26	40.00	0.49
	Young	Zone A	84	32	38.10	0.49
	Young	Zone B	44	18	40.91	0.50
	Total		366	134	36.61	0.48
Grand total			756	223	29.50	0.46

SD = Standard Deviation

of 39% in goats. In contrast, Bastiaensen, Mohanta *et al.* (2007) and Kanyari *et al.* (2009) reported lower rates, respectively 8% in Togo sheep, 10.7% in Black Bengal goats and 21% in Kenya small ruminants. Similarly to the metacestodes infection trend, monieziasis was more prevalent in wet season than in dry one. This is in accordance with the parasite biology. The study revealed that the infection was also more prevalent in sheep than in goats.

The vulnerability of sheep compared to goat was already observed by Kumsa *et al.* (2011) in Ethiopia. The fact that hosts age did not have significant influence in the infection could be explained by the chronicity of the disease in the study areas.

CONCLUSION

Overall, the parasitological prevalence of cestodes infections (cysticercosis notably) was so high that there is matter to worry. A strict sanitary policy is required in order to compel people not to handle and eat non-inspected meat. As most of people in Benin pull their income from livestock, it is likely that the control of small ruminant's parasites (and cestodes particularly) will lower economic losses through meat depreciation and then be a significant way of fighting poverty.

ACKNOWLEDGEMENTS

This study has been funded by Association Doguici (a NGO of scientific and socioeconomic development in Benin) and by The Ministry of Higher Education and Scientific Research of Benin. The researchers express their gratitude to these partners. They are also grateful to Dr. Minnahoue Tchoutchou and Dr. Germain Achade (respectively director and veterinary inspector of Cotonou abattoir).

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