

PORCINE CYSTICERCOSIS IN VILLAGE PIGS OF NORTH-WEST CAMEROON

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Abstract:

A study was carried out in two villages and one marketplace of the Batibo sub-division in North-West Cameroon to determine the prevalence of porcine cysticercosis. The results showed that 4.44% of 383 pigs were positive at tongue examination whereas ELISA detected circulating antigens in 27.7% of 271 pig sera. A questionnaire survey in 140 pig raising households indicated that 59.3% of them lacked latrines while in 75.7% of the households members defecated directly into pigpens. The seroprevalence of porcine cysticercosis was significantly higher in households without latrines than in those with latrines. Similarly, significantly more seropositive pigs were present in households that defecated in the pig pens (35.5%) than in those that did not (14.4%). Although 91.4% of pig raising households did know of pig cysticercosis, only 28.6% were aware of the link with human taeniasis and only 10.7% were aware of human cysticercosis.

Introduction

Taenia solium cysticercosis is an under-recognized, economic and public health problem in many developing countries, especially in Africa (Tsang & Wilson, 1995; Geerts *et al.*, 2002). According to Preux *et al.* (1996) cysticercosis is almost non-existent in Muslim countries but affects almost all sub-Saharan countries. The *T. solium* taeniasis/cysticercosis complex is associated with poor sanitation and hygiene, poor methods of pig husbandry and poor meat inspection and control. The occurrence of the taeniasis /cysticercosis complex has been reported already in some parts of Cameroon (Marty *et al.*, 1985, 1986; Zoli *et al.*, 1987; Awa *et al.*, 1999; Assana *et al.*, 2001; Pouedet *et al.*, 2002). In order to obtain baseline data on the prevalence of porcine cysticercosis in the North-West province of Cameroon and to determine factors associated with the transmission of this zoonosis, an epidemiological study was undertaken in the Batibo sub-division of this province.

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Materials and Methods

Study site

The study was carried out between April and August 2001 in three localities (Ashong, Central Batibo and Guzang) of Batibo (North-West province of Cameroon). The area is situated between latitude 5° and 6°N and longitude 9° and 10°E. The altitude varies from 1600 m to 2000 m above sea level. There are two seasons: the rainy season (March to November) and the dry season (November to February). An average annual precipitation of 2500 mm is recorded in the area.

According to the Veterinary Services in Batibo, the pig population in the area is estimated at about 10,000. Pigs play a very important social, cultural, religious and economic role. Many families keep a few pigs, which are usually confined to pens and are commonly fed human faeces. During some periods of the year some pigs are allowed to roam freely.

Survey on pig cysticercosis

All piggeries in Ashong (n=125) and 15 (selected on the basis of accessibility) out of 27 piggeries in Batibo were visited. All pigs were sampled except pregnant sows, nursing sows with litters less than 2 month old and piglets younger than two months. Only five farmers refused collaboration. A total of 271 animals were examined in both localities, 195 of which were males and 76 females. The majority of the animals (214 of 271) was younger than 12 months. Blood samples were taken from 219 pigs in Ashong, whereas only 140 were examined by tongue inspection. At Central Batibo 52 pigs were examined by tongue inspection and blood sampled. Blood was collected from the jugular vein using a vacutainer. The serum was conserved at -20°C until laboratory analysis was done.

Besides this village survey, a total of 191 pigs were examined at the Guzang market for cysticercosis by tongue inspection, 120 of which were males and 71 females. The majority of these animals (156 of 191) were younger than one year. Blood samples were not collected from these animals.

Household questionnaire

A questionnaire survey on the socio-economic and technical characteristics of pig production and occurrence and transmission of taeniasis/cysticercosis due to *T. solium* was carried out in 140 pig raising households in Batibo and Ashong, in which pigs were sampled as described above. Information on the awareness of cysticercosis in pigs and the relationship between human taeniasis and pig and human cysticercosis was also collected. Hygienic and sanitary conditions were inquired and confirmed by direct observation. The respondent in each household was the person taking care of the pigs or the head of the household, although sometimes intermediaries were required.

Enzyme-linked immunosorbent assay for detection of circulating antigens (Ag-ELISA)

The Ag-ELISA was performed as described by Dorny *et al.* (2000) with slight modifications. The serum samples were pre-treated using trichloroacetic acid (TCA) and used in ELISA at a final dilution of 1/4. Two monoclonal antibodies (MoAb) were used in a sandwich ELISA. MoAb B158C11A10 was diluted at 5µg/ml in carbonate buffer (0.06 M/pH 9.6) for coating and a biotinylated MoAb B60H8A4 (1.25µg/ml in PBS-T20/NBCS) was included as detector antibody. The incubation was carried out at 37 °C on a shaker for 30 min for the coating of the first MoAb and for 15 min for all subsequent steps. The chromogen/substrate solution consisting of orthophenylene diamine (DAKO, #S2045) and H₂O₂ was added and incubated without shaking between 30-33°C for 15 min. To stop the reaction, 50µl of 4N H₂SO₄ was added to each well. The plates were read using an ELISA reader (Labsystem Multiskan RC) at 492 nm. Each sample was tested in duplicate, and on

each ELISA plate two positive reference serum samples from local naturally infected pigs (*T. solium* cysticercosis confirmed at slaughter) and eight serum samples from *T. solium* cysticercosis-free pigs were included. These reference negative samples were taken from pigs, which did not show nodules at tongue palpation and did originate from a local farm with good hygienic conditions and without any history of cysticercosis.

The mean optical density (O.D.) of each serum sample was compared with a series of reference negative serum samples (n = 8) at a probability level of p = 0.001 to determine the cut-off using a modified Student Test (Sokal & Rohlf, 1981).

Statistical analysis

The Chi Square test (X^2) as described by Steel & Torrie (1980) was used to compare differences of significance between proportions at a probability level of 5%.

Results

Table 1 summarizes the results of the tongue inspection and the Ag-ELISA. Of the 383 pigs subjected to tongue examination 17 (4.4%) were found infested with cystic lesions, whereas 75 of 271 (27.7%) were seropositive.

Table 1. Prevalence of porcine cysticercosis in Batibo sub-division, Cameroon by tongue inspection (T) and Ag-ELISA (E).

Locality		Pigs examined	Infected pigs	
			Number	Prevalence (%)
Ashong	E	219	72	32.9
	T	140	1	0.7
Central Batibo	E	52	3	5.8
	T	52	0	0.0
Guzang Market	E	ND	ND	ND
	T	191	16	8.4
Total	E	271	75	27.7
	T	383	17	4.4

ND =Not Done

Table 2 shows the comparison between the results of the Ag-ELISA and the tongue inspection. Whereas only one of 192 animals was found positive by tongue inspection, the Ag-ELISA allowed the detection of another 74 infected animals.

Table 2. Comparison of the results of tongue inspection and Ag-ELISA in village pigs in Cameroon

	T+/E+	T+/E-	T-/E+	T-/E-	Total
Ashong	1	0	71	68	140
Central Batibo	0	0	3	49	52
Total	1	0	74	117	192

T: tongue inspection; E: Ag-ELISA

One hundred and twenty eight (91.4%) of the 140 households were aware of the existence of porcine cysticercosis against only 10.7% for human cysticercosis. Also, 28.6% of

the households knew that a direct relationship exists between human taeniasis and pig cysticercosis. The percentage of households which did not possess a latrine was 59.3%, while 75.7% declared that members of the households deliberately defecated in pigpens. The absence of latrines and deliberate defecation in pigpens was significantly higher ($p < 0.05$) in Ashong than in Central Batibo.

The seroprevalence of porcine cysticercosis was higher ($p < 0.05$) in households without latrines (34.1%) than in households with latrines (21.6%) (table 3). The prevalence rate was equally higher ($p < 0.05$) in households that defecated in their pigpen (35.5%) than in those that did not (14.1%). There were two predominant pig husbandry systems practised in Batibo sub-division: permanent confinement (60.7%) and partial confinement (39.3%). The proportion of pigs infected with cysticercosis was slightly higher in permanently confined (29.0%) than in partially confined pigs (25.3%). This difference, however, was not statistically significant ($p > 0.05$).

Table 3. Factors associated with porcine cysticercosis (Ag-ELISA) in Ashong and Central Batibo, Cameroon.

	No. of pigs examined	No. (%) of infected pigs
Type of management		
Partial confinement	95	24 (25.3)
Permanent confinement	176	51 (29.0)
Household hygiene		
No latrine	132	45 (34.1)
Presence of latrine	139	30 (21.6)
Defecation in pig pen	172	61 (35.5)
Effective use of latrine	99	14 (14.1)

Discussion

Although tongue nodules were detected in only 4.4% of the examined animals, the seroprevalence of 27.7% obtained in this study suggests that porcine cysticercosis is widespread in the Batibo subdivision of North-West Cameroon. These results confirm the observations of Nguekam *et al.* (2003) and Pouedet *et al.* (2002) that the monoclonal antibody based Ag-ELISA is much more sensitive than tongue inspection. Since this antigen detection ELISA is known to detect only living cysticerci both in cattle (Brandt *et al.*, 1992) and in pigs (Nguekam *et al.*, 2003), the number of seropositive pigs is a good indication of animals which present a risk to the consumer. According to Pouedet *et al.* (2002) the sensitivity and specificity of the Ag-ELISA for the detection of porcine cysticercosis as derived from Gibbs sampling analysis is 85.8-87.2 and 98.1-98.9%, respectively. Although data on the occurrence of *Cysticercus tenuicollis* in Cameroonian pigs are not available, it cannot be excluded that some cross-reactions might occur with the metacestodes of *T. hydatigena*.

Even though 28.6% of the households were aware of the direct relationship between human taeniasis and porcine cysticercosis, clandestine trade in infected pigs is still common in the study area. Infected live pigs and carcasses are cheaper on the clandestine market. It is common practice by consumers of measly pork to salt, dry or cook the meat at high temperatures for a long time. Although the latter measure is undoubtedly very effective in destroying the cysts, pork consumed during most traditional ceremonies is usually not adequately cooked because of large amounts of meat that have to be prepared during a short

period of time. One of 10 people interviewed was aware of the existence of cysticercosis in humans from observation of the cysts during traditional autopsies. It is customary in these villages that autopsies of persons who die suddenly are carried out by the villagers themselves.

The absence of latrines in 59.3% of the households and the direct defecation of 75.7% of the interviewed people in pigpens were important factors associated with the transmission of cysticercosis in the area. The latter practice has also been reported to be common in the West province of Cameroon (Marty *et al.*, 1986; Zoli *et al.*, 1987; Pouedet *et al.*, 2002). However, this is not the case in the Far North of Cameroon, where inhabitants are in the habit of defecating near the farms in the open air and where pigs scavenge the human excrement (Assana *et al.*, 2001). In Batibo sub-division, the local authorities obliged the inhabitants to construct latrines. However, this does not mean that these latrines are also effectively used, because there is a strong belief that pigs fed human excrement produce better quality pork than those fed otherwise. Defecation in the pigpen is therefore not only a means of faecal disposal in the area but also a cheaper way of feeding pigs.

Conclusion

This study clearly shows that in low-input pig farming - as is the case in the Batibo subdivision of the North-West province of Cameroon - all the conditions are present for an effective transmission of *T. solium* from man to pigs and vice versa. The region can be considered as endemic for *T. solium* cysticercosis since prevalence figures were similar to those obtained in other known endemic regions in Mexico or Peru (Sarti *et al.*, 1992, 1994; Garcia *et al.*, 1999). Very often good correlations have been observed between the presence of porcine and human cysticercosis in endemic regions (Flisser *et al.*, 2002). Studies are currently ongoing in order to examine the prevalence of human cysticercosis in this area.

The results of the present study have also identified certain community behavioural and environmental practices that must be modified in order to prevent the continued spread of this zoonosis. Given the fact that the majority of the people interviewed were very much aware of cysticercosis in pigs but that only about one in four knew of the association of the latter with taeniasis in man, efforts need to be made in the field of health education in order to clarify these issues and to bring about the necessary changes in knowledge and behaviour of the human population

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