

## SHORT REPORT: SEROPREVALENCE OF *TAENIA SOLIUM* CYSTICERCOSIS IN PIGS IN BAHIA STATE, NORTHEASTERN BRAZIL

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**Abstract.** To determine the prevalence and etiologic factors of *Taenia solium* cysticercosis in pigs in the state of Bahia, northeastern Brazil, we performed serological surveys in Salvador, the capital of the state, and in two local towns, Santo Amaro and Jequié. Residents raising free-roaming pigs in the study areas were randomly selected. Sera were obtained from the pigs and examined by the enzyme-linked immunoelectrotransfer blot assay (EITB). The prevalence of antibodies to *T. solium* was 4.4% (2 of 45) in Salvador, 3.2% (3 of 93) in Santo Amaro, and 23.5% (24 of 102) in Jequié. A significantly high seroprevalence in Jequié was associated with poor sanitary conditions, such as an open sewer system and no inspection process of pork before marketing.

Cysticercosis caused by *Taenia solium* is one of the most important parasitic diseases in both humans and pigs in many developing countries of Latin America.<sup>1</sup> In Brazil, several retrospective studies have shown that neurocysticercosis in humans is an important public-health problem.<sup>2–4</sup> These studies were principally based on hospital records; however, a large number of cases are considered to be undiagnosed due to no access to medical care. In the state of Bahia, northeastern Brazil, porcine cysticercosis has been considered widespread because meat inspections of slaughtered pigs are not an obligation before marketing. Free-roaming pigs are considered important carriers of *T. solium* as previously reported in Mexico.<sup>5,6</sup> However, very few reports of the prevalence and distribution of porcine cysticercosis in Brazil have been published, although pigs are the primary source of human infection. Since the prevalence of porcine cysticercosis is considered a useful epidemiological indicator of *T. solium* infection pressure,<sup>7</sup> we performed a serological prevalence survey of porcine cysticercosis in Bahia using enzyme-linked immunoelectrotransfer blot assay (EITB), which has shown a high sensitivity and specificity in the diagnosis of human and porcine cysticercosis.<sup>8,9</sup>

A survey was carried out in Salvador, the capital of the state, and in two local towns, Santo Amaro and Jequié (Figure 1). The sampling was a kind of cluster sampling, i.e., residents raising free-roaming pigs in these areas were randomly chosen, and all of their pigs except piglets under 1 month of age were examined. The targeted sample size in each area was not fixed and the samples were collected as much as possible during the survey. Forty-five and 93 serum samples were collected in Salvador and Santo Amaro, respectively, in 1997. In Jequié, 56 and 46 serum samples were collected in 1996 and 1998, respectively. According to the official report of the Bahia State in 1998, the number of pigs in Salvador, Santo Amaro, and Jequié was 202, 908, and 14,520, respectively. Consequently, 22.2%, 10.2%, and 0.7% of pigs in each area were examined. The samples were examined by the EITB as previously described.<sup>8,10</sup> A regional difference of seroprevalence was compared by  $\chi^2$  test.

The seroprevalence of *T. solium* was 4.4% (2 of 45) in Salvador, 3.2% (3 of 93) in Santo Amaro, and 23.5% (24 of 102); 25.0% (14 of 56) in 1996, and 21.7% (10 of 46) in 1998 in Jequié (Table 1). The sample-size base 95% confi-

dence interval (CI) of the seroprevalence in each area is 0.5–15.1%, 0.7–9.1%, and 16.4–32.6%, respectively. However, the sampling rate in Salvador and Santo Amaro is very high, so that the calculated seroprevalence represent more reliably the true seroprevalence of the populations.

It has been shown that the transmission of cysticercosis is not restricted to rural areas when poor sanitary conditions, such as no sanitary facilities or open sewer are present.<sup>11,12</sup> In Bahia, poor sanitary conditions and pig husbandry are commonly observed not only in rural areas, but also in urban areas, even in the capital. Residents who do not have latrines defecate outdoors, and water contaminated with filth from a dumping ground and/or a house latrine runs into the open sewer. Consequently, pigs roaming in these areas have access to human feces and contaminated water because of their coprophagic and bathing behavior. According to the census carried out by Brazilian government in 1991, 6.9% of residents in Salvador have no latrines and 6.2% use open sewers for their waste (Table 1). In Santo Amaro, 35.1% of residents have no latrines, but fewer residents (3.7%) use the open sewer than in Salvador (Table 1). Despite the obvious difference between these two areas in latrine conditions, there is no significant difference in seroprevalence of porcine cysticercosis. In Jequié, 28.0% of residents have no latrines and 17.7% use an open sewer (Table 1). Although residents with no latrines show the intermediate proportion, the percentage of residents using the open sewer is significantly higher in Jequié than in other two areas. Considering that seroprevalence of porcine cysticercosis in Jequié is significantly higher compared with those in the other areas ( $\chi^2 = 16.88$ ,  $P = 0.0003$ ), open sewer systems may be one of the most significant factors associated with *T. solium* infection in pigs. Free-roaming pigs in Jequié may have more chances of coming in contact with parasite eggs or proglottides excreted from persons infected with *T. solium* in open sewers although there are no data about the prevalence of human taeniosis in these areas.

In summary, a high prevalence of antibodies to *T. solium* in pigs has been demonstrated for the first time in a local town of Bahia. This high prevalence may result from the heavy environmental contamination of *T. solium* eggs, and it is possible that human cysticercosis is also endemic in the town. In addition, poor sanitary conditions, such as open



FIGURE 1. Map of the state of Bahia, Brazil, showing the 3 locations where porcine sera were collected.

sewer systems and no pork inspection process before marketing may contribute to the transmission of this parasite. Further understanding of the transmission dynamics of cysticercosis in Brazil is necessary for the development of effective control strategies.

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TABLE 1

Seroprevalence of porcine cysticercosis and sanitary conditions in the study areas of Bahia

	Salvador	Santo Amaro	Jequié
No. pigs examined	45 <sup>†</sup>	93 <sup>†</sup>	102 <sup>‡</sup>
Seropositive	2 (4.4%)	3 (3.2%)	24 (23.5%) <sup>§¶</sup>
No sanitary facility*	6.9%	35.1%	28.0%
Use of open sewer*	6.2%	3.7%	17.7% <sup>¶</sup>

\* Data from census carried out by Brazilian government in 1991.

<sup>†</sup> Samples collected in 1997.

<sup>‡</sup> Fifty-six and 46 samples collected in 1996 and 1998, respectively.

<sup>§</sup> Fourteen (25.0%) and 10 (21.7%) samples were seropositive in 1996 and 1998, respectively.

<sup>¶</sup> Significantly high proportion by  $\chi^2$  test.

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