

TRYPANOSOMA CRUZI INFECTION IN DOGS AND CATS  
AND HOUSEHOLD SEROREACTIVITY TO *T. CRUZI*  
IN A RURAL COMMUNITY IN NORTHEAST BRAZIL\*†

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**Abstract.** The prevalence of *Trypanosoma cruzi* parasitemia as determined by xenodiagnosis on domestic dogs and cats was correlated with household rates of seroreactivity to *T. cruzi* and household *Panstrongylus megistus* infestation in a rural area in northeast Brazil where *P. megistus* was the only domiciliary triatomine vector. *T. cruzi* infection was present in about 18% of domestic dogs and cats. Two-thirds of seroreactive children below age 10 resided in houses with *T. cruzi*-infected animals. In houses with a *T. cruzi*-infected dog or cat, as well as at least one infected *P. megistus*, the household rate of seroreactivity to *T. cruzi* was five times greater than in houses with non-infected domestic animals and no infected triatomine vectors. Domestic dogs and cats are important reservoirs of *T. cruzi* in an endemic area where *P. megistus* is the only domiciliary triatomine vector.

Domestic dogs and cats contribute to transmission of *Trypanosoma cruzi* infection to man wherever *Triatoma infestans*, *Triatoma dimidiata*, *Triatoma sordida* or *Rhodnius prolixus* are domiciliary vectors.<sup>1-3</sup> In contrast, in areas where *Panstrongylus megistus* is the principal vector, the relationship of dogs and cats to the human transmission cycle appears to be quite different. Thus, a recent study in the state of Bahia, Brazil, where *P. megistus* is present in houses but is not found in sylvatic sites, suggests that dogs and cats may not be important reservoir hosts.<sup>4</sup> In that study, based on serologic identification of the triatomine blood meal source, household infection rates were not analyzed in relation to *T. cruzi*

infection in domestic animals or *P. megistus*. At present, such data are lacking.

Accordingly, we sought to determine whether *T. cruzi* infection of dogs or cats is associated with serological positivity to *T. cruzi* in household members in a rural area in northeast Brazil in which *P. megistus* is the only domestic triatomine vector.

#### METHODS

The study area, located in Castro Alves, state of Bahia, Brazil, has been described and the serological findings have been reported.<sup>5</sup> A household census of domestic animals was completed in two contiguous fazendas (estates) during April-May 1975. As part of evaluation of a triatomine control program, the houses were searched for the vector, *P. megistus*, on three occasions between August 1973 and May 1975. One person (T.S.O.) searched each house 15 min after dusting with 10% pyrethrum in talc. The average collection time was about 15 min per house.<sup>6</sup>

#### Laboratory methods

Seroreactivity to *T. cruzi* in household members was demonstrated by a complement fixation titer of 1:8 or greater or an indirect fluorescent antibody titer of 1:64 or greater. The methods for these procedures have been published.<sup>5</sup>

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TABLE 1  
*T. cruzi* infection rates in dogs and cats according to household *P. megistus* infestation

Animal	In house <i>P. megistus</i>	No. examined	% infected
Dogs	Present	16	43.8
	Absent	22	0
Cats	Present	7	28.6
	Absent	20	15.0

Xenodiagnosis of dogs and cats was performed with 10 fifth instar *Triatoma infestans* nymphs. The owners of animals held the xenodiagnosis box on the animal's abdomen or ear for 20 min.

After 30 days the triatomine bugs were individually dissected and their rectal contents were examined for the presence of *T. cruzi*. In this report (Tables 2 and 3) the classification of "infected *P. megistus*" indicates a *T. cruzi*-infected specimen was found in the household.<sup>6</sup> "Evidence of *P. megistus*" signifies that either dead triatomine bugs or eggs were found or that a living triatomine bug was not examined for *T. cruzi* infection due to mishandling of the specimen.

#### RESULTS

In the two fazendas, 86.6% (264 of 307) of the residents were examined serologically and the overall rate of seroreactivity to *T. cruzi* was 38.3%.

##### *Census and xenodiagnosis results*

Of 65 houses in the study area, 58 were searched for the triatomine vector. In 43 of 58 houses, a total of 28 dogs and 41 cats were present. No other species of household animal was found. At least one dog or cat in 42 of the 43 houses was examined. Twenty-seven of 28 (96.4%) dogs and 38 of 41 cats (92.7%) were examined by xenodiagnosis. *T. cruzi* parasitemia was detected in 5 of 27 dogs (18.5%) and in 7 of 38 cats (18.4%) (Table 1).

##### *Relationship between P. megistus and household dogs and cats*

*Panstrongylus megistus* was found with similar frequency in houses with domestic animals (19/38) and without domestic animals (8/19). How-

ever, infected *P. megistus* were present more frequently in houses with dogs and cats (9/38) than in houses without them (1/19). All houses with infected cats and 2 of 5 houses with infected dogs had evidence of *P. megistus*.

##### *Household seroreactivity to T. cruzi and presence of dogs and cats*

In houses with *T. cruzi*-infected dogs or cats, the seropositivity rate of household members was 1.5 times that of persons in households with uninfected dogs and cats (Table 2).<sup>\*</sup> The household seropositivity rates were not significantly different in houses with uninfected or no domestic dogs and cats.<sup>†</sup> Significantly, 6 of 9 children below age 10 years who were seroreactive for *T. cruzi* were from homes with infected domestic animals. No infected children were found in homes with uninfected dogs or cats (Table 3).

##### *Household seroreactivity to T. cruzi and presence of dogs, cats, and P. megistus*

The seropositivity rate in houses with infected dogs and cats as well as infected *P. megistus* was about four times higher than in households with non-infected dogs and cats and no infected triatomine vectors (Table 2).<sup>‡</sup>

During the course of this study, in the study area a 2-year-old boy developed acute Chagas' disease and died of severe myocarditis and meningoencephalitis. This family was one of three not included in this study since they were not residents of the area at the time of the serological survey. The parents and three other siblings were seronegative. In the child's bed, a *T. cruzi*-infected *P. megistus* was found. The two household cats had *T. cruzi* parasitemia; no other domestic animals were present.

#### DISCUSSION

A high rate of seropositivity to *T. cruzi* in this rural area was associated with the presence of both *T. cruzi*-infected *P. megistus* and infected dogs and cats. Household infection rates were low or absent in children living in houses with

\* Chi-square test:  $\chi^2 = 4.92$ ,  $df = 1$ ,  $0.05 < P > 0.02$ .

† Chi-square test:  $\chi^2 = n.s.$ ,  $P > 0.05$ .

‡ Chi-square test:  $\chi^2 = 26.82$ ,  $df = 1$ ,  $P < 0.001$ .

TABLE 2

Distribution of household seroreactivity to *T. cruzi* according to the status of dogs and cats and *P. megistus* in the houses

Description of house		Houses	No. persons tested	% seropositive*
Animal	<i>P. megistus</i>			
<i>T. cruzi</i> -infected dogs and cats	Infected†	4	19	94.8
	Non-infected‡	7	49	28.6
Non-infected dogs and cats	Infected	5	22	54.6
	Non-infected	22	98	25.5
No domestic animals	Infected	1	3	66.7
	Non-infected	18	56	33.9
Total		57	247	36.4

\* Complement fixation positive = titer of 1:8 or more, or indirect fluorescent antibody titer of 1:64 or more.

† At least one *T. cruzi*-infected *P. megistus* found.

‡ Includes vestiges such as eggs or dead bugs, specimen not infected by *T. cruzi*, not examined for infection, or no *P. megistus* found.

non-infected *P. megistus* and non-infected dogs and cats. This suggests that in this area of north-east Brazil, where *P. megistus* is the only triatomine vector, dogs and cats may serve as reservoirs for human infection with *T. cruzi*.

The literature on Chagas' disease suggests that domestic animals have an important role within the domiciliary *T. cruzi* life cycle, even in areas where *P. megistus* is the principal domestic vector. In Lassance, Minas Gerais, when *P. megistus* was the most important domestic vector of that region, Carlos Chagas<sup>7</sup> found an infected cat in the household where he first demonstrated human *T. cruzi* infection in a young child—similar to the case we cited. It was his belief that domestic animals participated in the domestic *T. cruzi* life cycle. Later, in another *P. megistus*-infested area in Minas Gerais, Martins demonstrated by xenodiagnosis that the rate of *T. cruzi* parasitemia in man and domestic dogs and cats was similar.<sup>8</sup>

The most recent related study,<sup>4</sup> also from an

endemic area in Bahia, utilized data on the identification of blood meals from *P. megistus* found in houses. Contrary to our results, that study led to the conclusion that domestic animals did not significantly contribute to the domiciliary *T. cruzi* life cycle. The results, reported without reference to the population tested or indication of the controls used, showed that only 2.6% of the blood meals were from domestic animals. Furthermore, household infection rates were not analyzed in relation to *T. cruzi* infection in domestic animals or *P. megistus*. Low density house infestation is a characteristic of *P. megistus* in this rural endemic area.<sup>3,9</sup> Therefore, low rates of animal blood meals in *P. megistus* can impute an insignificant role in domestic transmission only if such low rates are associated with low rates of *T. cruzi* infection in man and domestic animals.

The behavior of natural *T. cruzi* infection in dogs and cats, which is fundamental for our understanding of their role in the epidemiology of

TABLE 3

Seroreactivity to *T. cruzi* in children less than 10 years of age according to presence of domestic dogs and cats or *P. megistus*

Status of animal	Children tested	% seropositive	Status of <i>P. megistus</i>	Children tested	% seropositive
<i>T. cruzi</i> -infected	20	30	<i>T. cruzi</i> -infected	13	53.8
Non-infected	32	0	Non-infected	24	8.3
Not present	16	18.8	Not present	31	0
Total	68			68	

Chagas' disease, is not known. High levels of *T. cruzi* parasitemia in naturally infected dogs and cats have been reported,<sup>10</sup> but data on morbidity and mortality are lacking. In the laboratory, experimental infection induced in dogs and cats closely resembles human infection, with high mortality due to cardiac pathology<sup>11</sup> and even prolonged parasitemia.<sup>12</sup> However, the relative susceptibility of dogs and cats to naturally transmitted *T. cruzi* has not been determined.

In our study the presence of domestic animals per se did not increase the household prevalence of *P. megistus* infestation. On the other hand, in most houses with infected cats and dogs evidence of *P. megistus* was also found. Finally, more houses with domestic dogs and cats had infected *P. megistus* than did houses without domestic dogs and cats. Thus, the association of the triatomine vector, *P. megistus*, with domestic animals in the same house could potentially maintain the domiciliary *T. cruzi* life cycle.

These observations support our conclusion that domestic dogs and cats are important *T. cruzi* reservoirs in an area where *P. megistus* is the only domiciliary triatomine vector and, when infected with *T. cruzi*, their presence is associated with high rates of seroreactivity to *T. cruzi* in the inhabitants of households, particularly in children.

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