

EPIDEMIOLOGIC STUDIES OF CHAGAS' DISEASE IN THE URBAN ZONE OF TERESINA, STATE OF PIAUÍ, NORTHEASTERN BRAZIL

Dalva N. da C. Bento¹, Ana Z. C. L. Branco²,
Marise R. Freitas³ and Artur da S. Pinto³

The triatomine species Rhodnius nasutus and Triatoma pseudomaculata were captured on palm trees Orbygnya martiana "babaçu", in the urban zone of Teresina. This kind of palm tree is largely distributed in Piauí State. The predominant species was R. nasutus; the young instars predominated. The infestation index of palm trees and the infection index of triatomines by flagellates were 96.0 and 29.1%, respectively. Marsupials, bats and a rodent were captured in palm trees. The flagellates found in both triatomines and marsupials were morphologically and biologically indistinguishable from Trypanosoma cruzi. Forty seven percent (481/1,025) of triatomines were found concentrated in six palm trees where marsupials circulated. Of the total of 1,025 triatomines 230 (22%) were infected by flagellates and 53.0% (123/230) of these infected triatomines were present in the same six palm trees. No evidence of triatomine domiciliation or human transmission was observed in the houses in the vicinity of palm trees. The results suggest that marsupials play an important role in the life-cycle of T. cruzi in this region. The natural focus of Chagas' disease, demonstrated in the present study could represent a potential epidemiological threat.

Key words: Chagas' disease. Epidemiologic studies. Vectors. Reservoirs. Triatomines. *Orbygnya martiana*.

Palm trees of the *Orbygnya martiana* species, known as "babaçu", have been described in some Brazilian regions to harbour triatomine species, vectors of *T. cruzi* the etiological agent of Chagas's disease. In such palm trees, triatomines feed on mammals which may be reservoirs of *T. cruzi* and consequently establish the life-cycle of this protozoon^{2,3,5}.

The present paper describes the presence of triatomines and mammals, both infected by trypanosomes indistinguishable from *T. cruzi* in palm trees of this species in the urban zone of Teresina. The rare cases of human seropositivity for *T. cruzi* so far detected in this city area seem to be recently imported.

MATERIALS AND METHODS

Capture of insects and mammals on palm trees. In order to capture triatomines and mammals, palm trees were cut down over a white cloth. Each frond was removed from its base and carefully searched for the presence of triatomines, as well as, mammals.

1. Dept^o de Biologia, CCN, Universidade Federal do Piauí.
2. Dept^o Biomédico, CCN, Universidade Federal do Piauí.
3. Dept^o de Medicina Comunitária, CCS, Universidade Federal do Piauí, Teresina, Piauí.

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Examination of triatomines. The triatomines found were classified and examined for flagellates by abdominal compression or gut dissection. Groups of 5 mice (approximately 2 months old) were each inoculated intraperitoneally with flagellates from positive triatomines. They were later examined by fresh blood preparations and xenodiagnosis in order to detect parasitaemia.

The evaluation of bloodmeal source was made in 76 triatomines from 11 palm trees, by means of a precipitin test using the gut contents of the insects as described by Siqueira¹⁷. The following antisera were used: human, dog, cat, cattle, pig, donkey, rodent, bird, marsupial, amphibian and reptile, all prepared by three intramuscular injections of sera with Freund's complete adjuvant, at intervals of three weeks, in rabbits.

Search for flagellates in captured mammals. The captured mammals were examined to verify possible infections by hemoflagellates using fresh blood preparations and xenodiagnosis. Samples of their blood were inoculated in groups of 5 young mice. The flagellates isolated from triatomines, previously fed on these animals, were also inoculated into mice. All mice were later examined by fresh blood preparations and xenodiagnosis.

Xenodiagnosis. This technique, as used by Freitas¹⁰, consisted on feeding clean triatomines (3-4

instar), reared in the laboratory on the vertebrate's blood. It was performed using the species *Triatoma brasiliensis*, *Rhodnius prolixus* and *Dipetalogaster maximus*. About 15 insects were fed on each animal and 25-30 days later, their feces examined microscopically.

Transmission of Chagas' disease. Finally, to verify if triatomine domiciliation and human transmission of Chagas' disease occurred, 56 houses situated in the vicinity of palm trees were searched for the presence of triatomines. Blood was collected for specific serology against *T. cruzi* by indirect immunofluorescence (IIF) test from 237 dwellers of those houses.

RESULTS

Among 55 palm trees searched, 53 were infested by triatomines (96.0%). The distribution of palm trees in the urban zone of Teresina is showed in Figure 1. A total of 1,025 triatomines were captured and the rate of infestation varied from 0 to 229 (18.6 average). Only two triatomine species were found: *Rhodnius nasutus* (95.0%) and *Triatoma pseudomaculata* (5.0%). The last species was found in only 4 palm trees, always associated with *R. nasutus*. The distribution of triatomine species and their infection with *T. cruzi* on palm trees are shown in Figure 1. Data on triatomines and their index of infection by flagellates are shown in Table 1

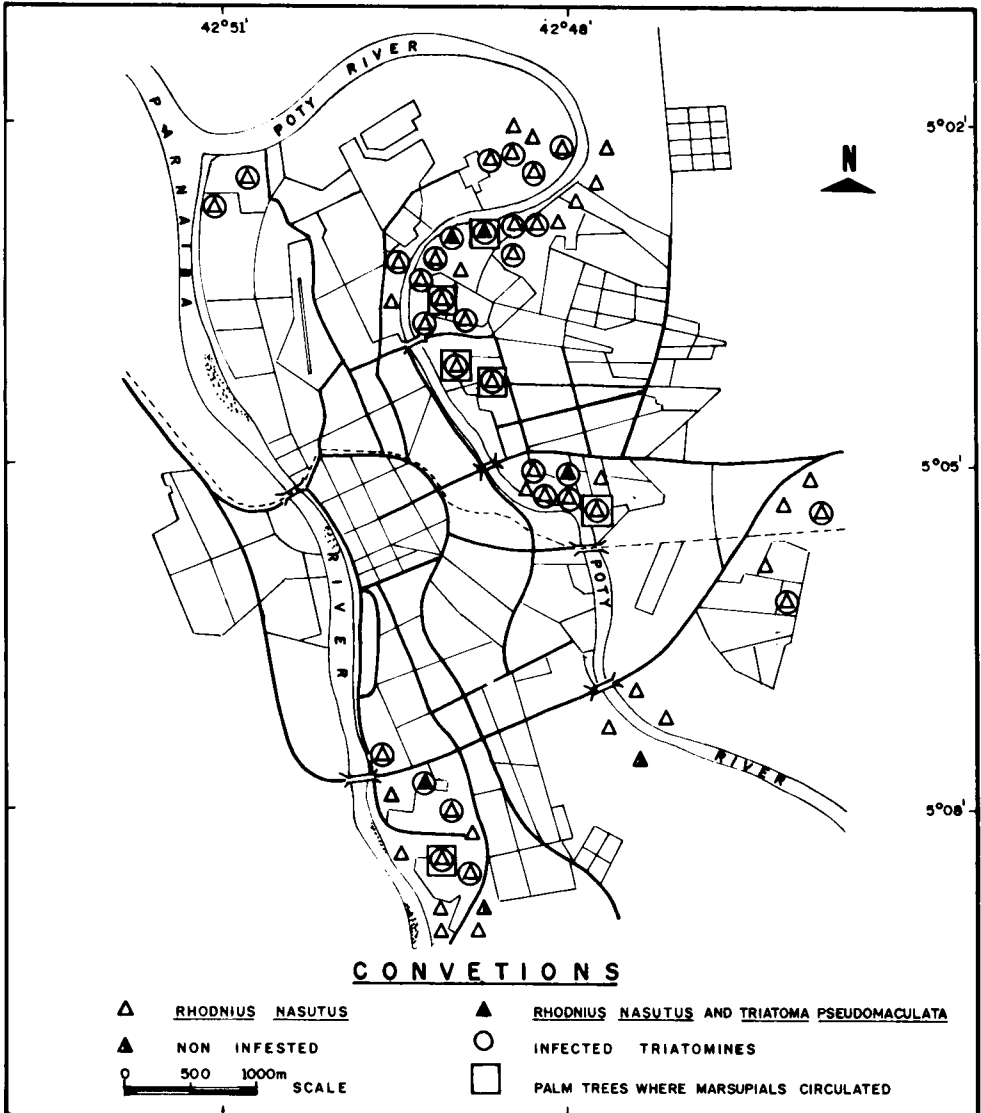


Table 1 – Triatomines captured on palm trees *Orbignyia martiana* in the urban zone of Teresina, State of Piauí, Northeastern Brazil

Species	Adults				Larvae				Totals			
	Captured	Examined	Infected	%	Captured	Examined	Infected	%	Captured	Examined	Infected	%
<i>Rhodnius nasutus</i>	140	128	69	54.0	832	613	125	20.4	972	741	194	26.2
<i>Triatoma pseudomaculata</i>	–	–	–	–	53	50	36	72.0	53	50	36	72.0
Total	140	128	69	54.0	885	663	161	24.3	1,025	791	230	29.1

All groups of young mice inoculated with flagellates isolated from captured triatomines showed detectable parasitaemia. Of 76 precipitin tests 33 were positive against different antisera, as shown in Table 2. *R. nasutus* was feeding mainly on marsupials and birds. Data on captured mammals, their natural infection by hemoflagellates and parasitaemia in young mice inoculated with these flagellates are shown in Table 3.

Table 2 – Precipitin test for the identification of the bloodmeal source of triatomines captured on palm trees *Orbignyia martiana* in the urban zone of Teresina, State of Piauí, Northeastern Brazil

Species	Reactivity to precipitin test							
	Anti-marsupial	Anti-bird	Anti-rodent	Anti-donkey	Anti-amphibian	Total reptile	Total reactive	Total tested
<i>Rhodnius nasutus</i>	14	10	1	1	1	1	28	64
<i>Triatoma pseudomaculata</i>	5	0	0	0	0	0	5	12
Total	19	10	1	1	1	1	33	76

Marsupials, *Didelphis albiventris* and *Marmosa agilis agilis* were captured. Indication of the existence of marsupials was detected by precipitin test in 6 palm trees, in which 481 triatomines were captured (47.0% of a total of 1,025). Among the bugs 123 were infected with *T. cruzi* (53.0% of a total of 230). The distribution of those palm trees in the studied areas is shown in the Figure 1.

No triatomine species were found in the houses in the vicinity of palm trees. Specific serology against *T. cruzi* by indirect immunofluorescence (IIF) test revealed 2.0% of positivity among 237 inhabitants examined. All positive serum reactors had migrated recently from known endemic areas.

DISCUSSION

The triatomine species captured in the present study were *R. nasutus* and *T. pseudomaculata*, both reported as capable to colonising natural and artificial

ecotopes. The geographic distribution of *R. nasutus* is restricted to Northeastern Brazil^{8 9 13}. *T. pseudomaculata* is also encountered in bordering regions such as Ceará, Bahia and Goiás States^{4 8 9 14 18}. *R. nasutus* was described for the first time on palm tree *O. martiana* located in West Ceará State, by Alencar and Bezerra¹. In our study this triatomine was the predominant species in this kind of palm tree which is largely distributed in Piauí State. In general, the high rate of infestation of palm trees, the predominance of young instar and the high index of infection of triatomines in our studies agrees with previous reports with other species of triatomines^{2 3 5}. Our data on bloodmeal source of triatomines which showed marsupial and bird preference is also compatible. *T. pseudomaculata* encountered in only palm trees, always as larvae associated with *R. nasutus*, may be initiating its colonisation of palm trees of this region. This species may be better adapted to other ecotopes.

The observation of Barretto⁶ indicates that the

Table 3 – Natural infection of mammals captured on palm tree *Orbignya martiana* in the urban zone of Teresina, State of Piauí, Northeastern Brazil, with flagellates similar to *T. cruzi* detected by blood examination and production of parasitaemia in young mice.

Species		Number captured	Number examined	Number infected	Detectable parasitaemia in young mice
<i>Marmosa agilis agilis</i>	marsupial	3	3	2	2
<i>Didelphis albiventris</i> *	marsupial	2	2	2	2
<i>Oryzomys subflavus</i>	rodent	1	1	0	
<i>Eumops bonarensis</i>	bat	2	2	0	
<i>Myotis nigricans</i>	bat	1	1	0	
<i>Molossops temminckii</i>	bat	1	1	0	
Unidentified bat		3	3	1	0
Total		13	13	5	4

* previous known as *D. azarae*

high index of infection of triatomines with *T. cruzi* in the palm tree *O. martiana* is due to the frequency of infected marsupials, rodents and bats that are found living together with the triatomines in this kind of palm tree. This is confirmed in our study. Six palm trees, where marsupials circulated, harboured a concentration of 53% of infected triatomines.

We may infer that the flagellates found in the triatomines and marsupials in the present study are *T. cruzi* by their capacity to produce parasitaemia in young mice. Non infected bats were captured on palm trees in which triatomines were also not infected. However, bats in Piauí State are frequently found infected with *T. cruzi*-like flagellates, but these are unable to produce parasitaemia in young mice¹⁶. The systematic position of these trypanosomes remains in discussion, but they could be potentially infective for man⁷.

All persons who presented positive serology against *T. cruzi* had migrated recently from other regions where they could have acquired the infection. Infection of man in the study sites is likely to be exceptional, but the existence of a natural focus of Chagas' disease as demonstrated in the present work, represents what Hoare¹² called a potential epidemiological threat. Its documentation may be important in a future campaign against the disease.

SUMÁRIO

As espécies de triatomíneos Rhodnius nasutus e Triatoma pseudomaculata foram capturados em palmeiras Orbignya martiana "babaçu", situadas na zona urbana de Teresina. Este tipo de palmeira é

largamente distribuída no Estado do Piauí. R. nasutus foi a espécie predominante. O índice de infestação das palmeiras e o índice de infecção dos triatomíneos por flagelados foram 96.0 e 29.1%, respectivamente. O estágio de ninfa predominou entre os triatomíneos capturados. Em algumas palmeiras, foram capturados marsupiais, morcegos e um roedor. Os flagelados encontrados tanto nos triatomíneos como nos marsupiais eram morfologicamente e biologicamente indistinguíveis do Trypanosoma cruzi. Quarenta e sete por cento (481/1.025) foram encontrados em seis palmeiras onde marsupiais circulavam. De um total de 1.025 triatomíneos 230 (22%) estavam infectados por flagelados e 53.0% (123/230) destes triatomíneos infectados foram também capturados nas mesmas seis palmeiras. Não foi observada evidência de domiciliação de triatomíneos ou da transmissão da doença de Chagas nas residências próximas às palmeiras. Os resultados sugerem que os marsupiais desempenham papel importante no ciclo do protozoário nesta região. Um foco natural da doença de Chagas, como o demonstrado no presente estudo, representa uma ameaça epidemiológica em potencial.

Palavras-chaves: Doença de Chagas. Estudo epidemiológico. Vetores. Reservatórios. Triatomíneos *Orbignya martiana*.

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