

Considerations on the Epidemiology and Transmission of Chagas Disease in the Brazilian Amazon

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The Brazilian Amazon has long been considered a non-endemic area for Chagas disease, in spite of the well-known enzootic cycle involving a variety of wild mammals and triatomine bugs of this region (Rodrigues & Melo 1942, Deane 1964, 1967), whose natural environment has already been much altered by human activities in ways that are important for vector-host balance (Coura 1990, Fraiha Neto et al. 1995), necessitating attention and specific programs of epidemiological vigilance (Feitosa 1995). Chagas disease merits close attention at this time: there is growing number of cases that now exceeds one hundred cases in the past few years, the peri-domestic cycle of *Trypanosoma cruzi* is still in the adaptation phase in the region, and the time is opportune for the adoption of vector control measures.

Chagas disease in the Brazilian Amazon is on the rise. Data from January of 1998, reveal 148 cases of which 121 were acute with 5 resulting in death (67 cases were associated with family episodes and 54 were not so associated) and 27 chronic cases. In terms of occurrence by state, 71 were in Pará (47.9%), 51 in Amapá (34.5%), 14 in Amazonas (9.5%), 9 in Maranhão (6.1%), and 7 in Acre (4.7%), not considering serological screening done in the region. It must be remembered also that these data represent only those notifications that came to the notice of the Instituto Evandro Chagas (IEC) and surely represent only the tip of the epidemiological 'iceberg'. The State of Pará shows the greatest number of cases because it has in Belém facilities for diagnosis, while no cases were reported from the states of Roraima and

Rondônia, possibly because of the lack of a notification system and of qualified medical personnel to recognize acute cases of Chagas disease.

Of the types of transmission already observed, such as vectoral (Valente et al. 1993a, 1996) or transfusional (Valente et al. 1993c), transmission associated with family micro-epidemics merits further attention. This modality suggests transmission by ingestion. Episodes involving whole families, in the absence of triatomine vectors in the dwellings, make up a curious aspect of the disease in the Amazon region. Of the 121 cases recognized as acute, 67 (55.4%) are associated with family micro-epidemics and now account for 17 episodes (Table). The possibility of infection by ingestion, although a mechanism still not well elucidated, appears to be the best hypothesis with which to explain the increasing number of these episodes (Fraiha Neto et al. 1995).

This hypothesis finally appears to have explained in a recent episode studied in the State of Amapá (Valente et al. 1997) where 17 people became infected by drinking assai palm fruit juice. Sylvatic triatomine bugs attracted to electrical lights possibly fell into the machine used to process the juice consumed by the patients. A similar episode was related from the State of Paraíba (Shikanai-Yasuda et al. 1991).

All of the patients reside at the Monte Castelo sawmill, locality called Rio Bispo, municipality of Mazagão, State of Amapá, and belong to four families that live in a villa within 50 m of each other. One resident recognized a triatomine bug in a sample collection shown to her, although she could not remember the species she had seen that year in one of the residences. None of the residents had ever been out of the state. The first symptoms appeared in November of 1996 in a child who showed fever, headaches, swelling of the legs, and yellowish discoloration of the skin. His mother took the child to the health posts at Porto de Santana and Macapá where no definite diagnosis could be given and where the patient was treated symptomatically.

Shortly afterwards in January, two neighboring families, composed of eight people including both adults and children, sought health care at the

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TABLE

Episodes of family micro-epidemics of Chagas disease in the Brazilian Amazon, in the years 1968-1997

Episode	Origin	Year of occurrence	Number of cases	Author(s)
1	Belém - PA	1968	4	Shaw et al. 1969
2	Belém - PA	1983	3	Souza et al. ^a
3	Macapá - AP	1984	6	Rodrigues et al. 1988
4	Macapá - AP	1984	2	Rodrigues et al. 1988
5	Belém - PA	1988	3	Souza et al. 1989
6	Cametá - PA	1988	5	Souza et al. ^a
7	Icoaraci - PA	1991	4	Crescente et al. 1992
8	Afuá - PA	1992	5	Valente et al. 1993
9	Rio Branco - AC	1993	3	Viana et al. 1994
10	Viseu - PA	1996	3	Valente et al. 1997
11	Belém - PA	1996	4	Valente et al. 1997
12	Mazagão - AP	1996	17	Valente et al. 1997
13	Belém - PA	1997	4	Valente et al. ^a
14	Santana - AP	1997	4	Valente et al. 1998 ^b
Total number of cases in all episodes			67	

a: unpublished cases; b: in press.

Macapá municipal health service, complaining of high fevers, intense headaches, pain in the joints, and edema in the legs. They showed cutaneous reddening of the whole body, principally of the face, and swelling of the eyelids of both eyes. The reddening of the skin was most intense during the first week and later regressed until it took the form of violet spots that came and went at day intervals.

A third family showed the same symptoms and sought the UMSM in Macapá. With the support of the IEC, several parasitological and serological examinations were done: QBC, blood smear, hemoculture, xenodiagnosis, IF and ELISA. Initially in 17 people and later in two others forms identical to *T. cruzi* were seen. The IEC in Belém later confirmed this finding and the patients were treated. A fourth family, although residing at the same villa, was away at the probable time that the contamination took place.

Among these families a common food habit is to consume assai palm fruit juice prepared daily at 20:00 hr in an electric machine and distributed to the families. The houses are surrounded by palm trees called urucuri (*Attalea phalerata*), recognized to be a habitat for wild triatomines in the region – 30% of the examined trees (6/20) were infested with the triatomines *Rhodnius pictipes* and *R. robustus*, infected with trypanosomes identical to *T. cruzi*.

The hypothesis of oral transmission now proposed for 14 episodes in the Brazilian Amazon was initially questioned because of the difficulty in demonstrating this type of transmission. This is because in most cases, patients were sent to us only long after initial infection and when epidemiological conditions were no longer favorable for inves-

tigation. In the Magazão episode, the largest in the region to come to our attention, transmission probably took place at night when on or more triatomines attracted to the electric lights fell into the juice being prepared in the machine and were ground up with the fruit pulp. Then the people who drank the juice became infected.

The presence of metacyclic forms of *T. cruzi* in anal gland secretions of the opossum (*Didelphis marsupialis*), an animal with wild and peri-urban habits, can not be overlooked as an element favoring the possibility of oral transmission in some outbreaks (Lenzi 1984, Naiff et al. 1987). The traditional mechanism of transmission of Chagas disease involving contact with metacyclic forms in the feces of wild triatomines may not be the most common type of transmission in the Amazon where several other types of transmission appear to be occurring.

The diversity of wild mammal reservoirs of the parasite in the region, such as *D. marsupialis*, *Phyllorhynchus opossum*, *Dasyurus novencinctus*, *Tamandua tetradactyla*, *Saimiri sciurius*, *Chiropotes satanas* and bats of the genus *Phyllostomus* (Deane 1964 1967, Deane et al. 1984, Valente et al. 1996) and of triatomines of the following species: *R. pictipes*, *R. robustus*, *Panstrongylus geniculatus*, *P. lignarius*, *Eratyrus mucronatus* and *Microtriatoma trinidadensis*, often found with high indices of natural infection with *T. cruzi* (Lainson et al. 1979, Miles et al. 1981), have suffered devastation of their habitats, giving rise to their attraction to artificial lights and invasion of human habitations. Extensive areas of babassu palm forests (*Orbignia phalarata*) are the habitat of triatomines such as *R. pictipes*, *R. robustus* and *P. geniculatus*. Constant

burning and deforestation of these areas promotes dispersal of these vectors that may enter houses by flying (Barrett & Guerreiro 1991).

Climatic modifications in the Amazon that involve a decrease in the amount of rain create dryer habitats such as those of central Brazil and favor the adaptation of triatomine species from these areas where Chagas disease is endemic. Ecosystem changes and modifications in the habitats of triatomines can lead to episodes such as those seen along the middle Rio Negro, municipality of Barcelos, State of Amazonas, with attacks of triatomines on cutters of piçava palm fibers or as on Marajó Island in the mouth of the Amazon where triatomines have become associated with domestic animals and have invaded human dwellings (Coura et al. 1994a, Valente et al. 1996).

The ecological pressure of deforestation, with the destruction of the natural habitats of these vectors, may force these triatomines to change their behavior, as has already happened in several parts of tropical America, and may lead them to become adapted to human dwellings. The importance of sylvatic or secondary species in Chagas disease and the possibility of their adaptation to human habitations have been little studied and few data are available. At this time we have only isolated reports of sylvatic triatomines colonizing houses. These species that are candidates for vectors are: *P. rufotuberculatus*, found colonizing houses in Bolivia (Noireau et al. 1994), *E. mucronatus* seen in Peru and Bolivia (Torrice et al. 1946, Lent & Wygodzinski 1979, Valencia-Telleria 1990, Noireau et al. 1995, 1997), *R. stali* found in Cochabamba in Bolivia (Tibayrenc & Le Pont 1984) with various degrees of importance in the transmission of Chagas disease, and *P. geniculatus*, the most widely distributed species in South and Central America, especially in the Brazilian Amazon region (Valente et al. 1994).

The importance of the accidental introduction of domesticated species of triatomines coming from areas endemic for Chagas disease should not be underestimated, especially for *Triatoma infestans*, a species now under control. This species that was introduced into Brazil at the beginning of this century needs to be well policed at the borders of the Amazon region, especially because it has already been reported for the state of Maranhão as well as the northern part of the state of Tocantins (Filho & Silveira 1979). Noireau et al. (1996) has referred to the geographical expansion of sylvatic foci of this species into areas of hot and humid climates such as those of the Amazon where it has yet to penetrate. This makes imperative a permanent entomological vigilance for this species, along the Trans-Amazon Highway, for example, where colonists live in pre-

carious houses that could easily be colonized by this triatomine. Because of its tenacious nature, combating *T. infestans* in the region would entail great operational difficulties and high costs.

The much needed implantation of an Epidemiological Vigilance Program for Chagas Disease in the Brazilian Amazon (Valente et al. 1995, Feitosa, 1995) should be seen as a measure that recognizes the region's priority for vigilance due to its geographical and human characteristics. In this manner, preventive actions should be undertaken and the region's ample potential for endemicity should be recognized. Those areas with relatively high serological prevalence (Coura et al. 1994b) should be mapped by means of an ample serological screening program. New serological studies for anti-*T. cruzi* antibodies should use more modern antigens, considering the past 20 years of human intervention in the region. Special strategies in vector control should be adopted to combat the possible domestication of triatomine vectors in the region.

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