# Role of Two *Triatoma* (Hemiptera: Reduviidae: Triatominae) Species in the Transmission of *Trypanosoma cruzi* (Kinetoplastida: Trypanosomatidae) to Man in the West Coast of Mexico

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*From August 1997 to August 1998, 334 specimens of* Triatoma longipennis *and 62 of* T. picturata *were collected in four groups of localities placed in the zone from Guadalajara, Jalisco to Tepic, Nayarit, in the West Coast of Mexico. Most* T. longipennis *were collected outdoors (69.2%) while most* T. picturata *(58.1%) were collected indoors. All collected specimens were examined for* Trypanosoma cruzi *infection, which was detected on 98 (29.3%)* T. longipennis *and 17 (27.4%)* T. picturata. *This study confirms the role of* T. longipennis *and* T. picturata *as some of the main* T. cruzi *vectors to humans in Mexico. Habitation Infestation Rate with* T. longipennis *was of 0.09 and with* T. picturata *was of 0.03 and the predominating ecotopes were pile of blocks, chicken coops, pigsties, wall crawls and beds.*

Key words: *Triatoma* - *Trypanosoma cruzi* - West Coast - Mexico

Chagas disease is one of the most important vector borne diseases in Latin America. In 17 countries it is an important public health problem, where about 16-18 millions of people are infected with the parasite *Trypanosoma cruzi* and 100 million are at risk of being infected (TDR 1987, WHO 1991, Schofield & Días 1995, Schofield & Dujardin 1997).

*Rhodnius prolixus* Stal, *Triatoma barberi* Usinger, *T. pallidipennis* Stal, *T. dimidiata* Latreille, *T. longipennis* Usinger, and *T. picturata* Usinger are the most important vectors of Chagas disease in Mexico (Velasco-Castrejón 1991, Velasco-Castrejón et al. 1994, Velasco-Castrejón & Salazar-Schettino 1996), the last two occurring in houses and chicken coops in villages of some states in the West Coast of Mexico, with frequent contact with humans as blood source and high infection rates with *T. cruzi* (Lent & Wygodzinsky 1979, Zárate & Zárate 1985, Beltrán & Carcavallo 1985, De la Torre et al. 1990, Velasco-Castrejón 1991, Magallón-Gastélum et al. 1998, Martínez-Ibarra et al. 1998). In many areas of Mexico, little is known about the real situation of the disease, because most human cases are restricted to rural areas, and because Chagas disease has been only recently considered as a priority for the Mexican Health Bureau.

The present study was carried out in some localities of Jalisco and Nayarit, México, on a zone considered important for the transmission of *T. cruzi* to human populations, according to the National Serological Survey (Velasco-Castrejón 1991). The aim of this study was to enhance the knowledge about the current situation of Chagas disease and the role of *T. longipennis* and *T. picturata* as vectors of Chagas disease in this zone, which can contribute to improve the programs of surveillance and control.

## MATERIALS AND METHODS

The study zone was divided in four areas of three localities each, about 30 km one from each other, from Guadalajara, Jalisco (20º40'N, 103º20'W) to Tepic, Nayarit (21º30'N, 104º54'W).

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Selection of localities and a sample size of ten houses per locality was based on triatomine infestation rates reported on previous studies, by inhabitants or personnel of the Mexican Health Bureau.

Triatomines were searched in four areas, one in Jalisco (A) and three in Nayarit (B, C and D). Area A - San Martín Hidalgo (20º27'N, 103º57'W), El Crucero (20º21'N, 103º59'W) and Cárdenas (20º26'N, 103º59'W), around 10 km approximately from each other; area B - Compostela (21º15'N, 104º53'W), Felipe Carrillo Puerto (21º10'N, 105º01'W), La Escondida (21º14'N, 105º01'W); area C - Jala (21º03'N, 104º26'W), Ahuacatlán (21º03'N, 104º29'W) and Los Toriles (21º0'N, 104º20'W); the three placed in the foothill of an ancient volcano; and area D - two cities, Tepic (21º30'N, 104º54'W) and Xalisco (21º27'N, 104º54'W ) and a village, Puga (21º33'N, 104º49'W).

Five field trips of one week each (August 1997, October 1997, December 1997-January 1998, April-May 1998, August 1998) were made to investigate the natural ecotopes of bugs (birds nests, hollow trees and cracks, holes in the ground, railing, piles of stone, etc.) and the domicile ecotopes on human dwellings, using the person per hour technique (Pinchin et al. 1981). Indoors (domestic) sites consisted of the interior of the houses and annexed buildings meanwhile outdoors (peridomestic) sites were located within 50 m of the actual living quarters of the inhabitants (Bautista et al. 1999), and wild habitats were considered those sites over 50 m far from the actual living quarters of the inhabitants. Every found triatomine was collected using tweezers and put into a glass container, labeled with the collection data (place of capture, sex and if they were alive or dead). The Lent and Wygodzinsky (1979) keys were followed to identify them.

In the laboratory, collected triatomines were fed on Swiss mice and placed individually on Petri dishes until defecation. Infection by *T. cruzi* was investigated by microscope examination of faeces. Detected parasites were intraperitoneally inoculated to Swiss mice.

Natural infection indices and Habitation Infestation Rate (HIR), taking account only habitations with effective risk of transmission, were determined according to Silveira et al. (1984).

## RESULTS

A total of 396 specimens, 334 *T. longipennis* (84.3%) and 62 *T. picturata* (15.7%) were captured.

Significantly (P<0.01) more *T. longipennis* (231/334, 69.2%) were collected outdoors than indoors (76/334, 22.8%) and than in a wild ecotope (27/334, 8.1%). Infection indices in *T. longipennis* varied from 0 to 57.6%, according to the area (the infection index was 29.3% for the entire zone) (Table I). HIR with *T. longipennis* varied from 0.02 to 0.2 according to the area (HIR with *T. longipennis* was 0.09 for the entire zone) (Table I).

TABLE I

*Triatoma longipennis* captured according to the area, infection by *Trypanosoma cruzi* flagellates, and Habitation Infestation Rate (HIR)

| Area | Triatomines | | | Infection index (%) | HIR |
|---|---|---|---|---|---|
| | + | - | Total | | |
| A | 41 | 123 | 164 | 25 | 0.20 |
| B | 8 | 32 | 40 | 20 | 0.04 |
| C | 0 | 45 | 45 | 0 | 0.02 |
| D | 49 | 36 | 85 | 57.6 | 0.09 |
| Total | 98 | 236 | 334 | 29.3 | 0.09 |

A pile of stones was the only ecotope where some *T. longipennis* were collected on the wild areas, meanwhile the predominating ecotopes outdoors were piles of blocks, chicken coops, pigsties and garbage dumps surrounding some houses; indoor triatomines were collected from wall cracks and beds.

Significantly (P<0.05) more *T. picturata* (36/62, 58.1%), were collected indoors than outdoors (26/62, 41.9%) and none in a wild ecotope. Infection indices in *T. picturata* varied from 0 to 60%, according to the area (the infection index was 27.4 for the entire zone) (Table II). HIR with *T. picturata* varied from 0 to 0.06 according to the area (HIR with *T. picturata* was 0.03 for the entire zone) (Table II).

The predominating ecotopes outdoors where *T. picturata* was collected were chicken coops and pigsties, meanwhile indoors triatomines were collected from wall cracks and beds.

TABLE II

*Triatoma picturata* captured according to the area, infection by *Trypanosoma cruzi* flagellates, and Habitation Infestation Rate (HIR)

| Area | Triatomines | | | Infection index (%) | HIR |
|---|---|---|---|---|---|
| | + | - | Total | | |
| A | 0 | 12 | 12 | 0 | 0.02 |
| B | 2 | 23 | 25 | 8 | 0.06 |
| C | 0 | 0 | 0 | 0 | 0 |
| D | 15 | 10 | 25 | 60 | 0.03 |
| Total | 17 | 45 | 62 | 27.4 | 0.03 |

## DISCUSSION

Proportion of collected *T. longipennis* (considering all collected specimens) was 84.3%, more than twice as those *T. longipennis* collected by Magallón et al. (1998) (40%, n = 1029) in a close area, meanwhile for *T. picturata* was 15.7 %, more than six times *T. picturata* collected by Magallón et al. (1998) (2.5%) in the same close area.

Most *T. longipennis* (69.2%) were collected outdoors, significantly (P<0.01) more than *T. picturata* (41.9%) but less than some other Mexican *Triatoma* species (*T. dimidiata*, *T. gerstaeckeri*), and similar to *T. lecticularia* (Martínez-Ibarra et al. 1992, 1998). The infection index was 29.3% for the entire zone, significantly (P<0.01) lower than *T. vitticeps* (56.9%) in Brazil (Gonçalves et al. 1998) and no significantly different (P>0.05) to *T. picturata* (27.4%) at the same zone and to some other Mexican triatomine species (*T. gerstaeckeri, T. dimidiata, T. pallidipennis*) (Martínez-Ibarra et al. 1992, 1998, Bautista et al. 1999).

Because of its high infection indices, abundance and contact with man, *T. longipennis* can be considered the most important vector for transmission of *T. cruzi* to human populations in the study zone. Likewise *T. gerstaeckeri* is considered the most important vector in Northeastern Mexico (Galavíz-Silva et al. 1990, Martínez-Ibarra et al. 1992), *T. dimidiata* in Southeastern and Southern Mexico (Guzmán et al. 1991, Martínez-Ibarra et al. 1998), *T. barberi* in Southwest and Southern Mexico (Salazar-Schettino et al. 1988) and *T. pallidipennis* in the Center (Bautista et al. 1999).

Most *T. picturata* (58.1%) were collected indoors, with a percentage significantly (P<0.01) higher than *T. longipennis* (22.8%) and than some other Mexican *Triatoma* species (*T. lecticularia, T. longipennis, T. gerstaeckeri, T. dimidiata, T. pallidipennis*) (Martínez-Ibarra et al. 1992, 1998, Magallón et al. 1998, Bautista et al. 1999).

The relationship among entomological indices show that in the zone the actual HIR with *T. longipennis* is 0.09 and with *T. picturata* is 0.03, no significant (P>0.05) difference was recorded. It means than nine of each 10,000 inhabitants of the study zone would have contact with *T. longipennis* and three of each 10,000 would have contact with *T. picturata* and may become infected.

This study confirms the role of *T. longipennis* and *T. picturata* as some of the main vectors in Mexico for the transmission of *T. cruzi* to man. However, *T. longipennis* outstands considering its relatively higher abundance and distribution, since this species was significantly (P<0.01) more abundant and distributed than *T. picturata.*

Additional research is necessary in this area, specially that related to blood or heart studies in human populations. Animal reservoirs have to be examined to detect sources of *T. cruzi* strains previously detected on human populations. These data are required before adequate triatomine control and epidemiological surveillance measures can be established.

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