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# Defaecation Pattern in Seven Species of Triatomines (Insecta, Reduviidae) Present in México

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**ABSTRACT. In order to compare the vectorial capacity of Mexican species of triatomine bugs (Insecta: Reduviidae) involved in the natural transmission of *Trypanosoma cruzi*, we tested three series of five bugs of every sex and species, the bugs were fed on mice. The defaecation latency time (DLT) of adults of seven species was determined. We studied: *Triatoma barberi, T. dimidiata, T. lecticularia, T. pallidipennis, T. picturata, T. phyllosoma and Rhodnius prolixus.* As a reference for comparison we tested the highly infective *T. infestans* (exotic to Mexico and considered the most important vector in South America). The results show that *R. prolixus, T. lecticularia* and *T. infestans* have similar DLT, the other five Mexican species are comparatively bad transmitters of *T. cruzi,***
**Key words: Triatomine bugs, *Triatoma*, defaecation patterns, *Trypanosoma cruzi, vectors.***

**RESUMEN. Con el fin de comparar la capacidad vectorial de siete especies de triatominos involucrados en la transmisión de *Trypanosoma cruzi* en México, se estudió la dinámica de la defecación de ejemplares adultos de: *Triatoma barberi, T. dimidiata, T. lecticularia, T. pallidipennis, T. phyllosoma, T. picturata,* y *Rhodnius prolixus*. Tres lotes de cinco ejemplares de cada sexo, por especie, se alimentaron sobre ratones inmovilizados; para cada insecto se registró el Tiempo de Latencia de la Defecación (TLD), lapso entre el inicio de la alimentación y la primera deyección. Como referencia, también se estudió *T. infestans* especie considerada como el transmisor más importante en Sudamérica. Los resultados muestran que las especies que exclusivamente están presentes en México, excepto *T. lecticularia*, presentan TLD mayores que *R. prolixus* y *T. infestans.* De acuerdo a este parámetro se pueden considerar a los triatominos mexicanos estudiados como malos transmisores de *T. cruzi*.**
**Palabras clave: Triatominos, patrones de defecación, transmisores, *Trypanosoma. cruzi*.**

## INTRODUCTION

Chagas' disease is a very important health problem in Latin America,[15] it is caused by *Trypanosoma cruzi* which is transmitted to man by means of the faeces of triatomine bugs. Originally affecting wild vertebrates, these insects adapted to feed on man and domestic animals as we invaded natural habitats, therefore Chagas' disease is now considered as a zoonosis.[6]

In Mexico there are areas where Chagas' disease is a public health problem,[14] and recently official regulations have been implemented to stop infection with *T. cruzi*, trough blood transfusion. However, there are only few studies on transmission dynamics and infective capability of Mexican triatominae compared to South American countries.

All triatomine bugs may get infected with *T. cruzi*, but only few species transmit the parasite to man.[2] Since the transmission mechanism is by contamination with insect faeces, then it is important to study the behavioral dynamics of the feeding-defecation process. The most efficient vectors defecate during host feeding or as soon as they finish blood sucking when they are still in contact with the host,[17] *Triatoma infestans* is considered the most important vector of *T. cruzi* in several South American countries[12].

In this work we registered and compared the dynamics of defaecation in seven triatominae species involved in the transmission of *T. cruzi* in Mexico, *T. infestants* is taken as a reference for comparison purposes.

## MATERIALS AND METHODS

***Triatomine* bugs.** We used insects from the colonies kept in the Departmento de Parasitología, Escuela Nacional de Ciencias Biologicas-IPN, México. We collected the founders as follows: *Triatoma barberi* from San Juan Atenco, Puebla; *T. dimidiata* and *T. pallidipennis* from Taxco, Guerrero; *T. lecticularia* from General Terán, Nuevo León; *T. phyllosoma* from Acapulco, Guerrero; *T. pícturata* from Tepic, Nayarit; and *R. prolixus* from Agua Azul Chiquito, Chiapas. *Triatoma infestans* were kindly donated by Dr. Oscar Velasco

(INDRE, Mexico).

The insects were kept at 28 ± 2 °C and 60–70% relative humidity. The bugs were fed every fifteen days on rabbit. We selected 30 day old adults, unfed for fifteen days. Experimental series had five male and five female bugs of every species. The bioassay was conducted in glass crystallising dishes (150 mm X 250 mm) covering the bottom with white bond paper to allow the insects walking and to facilitate detection of faecal droplets.

Adult laboratory mice were restrained with a wire mesh (5 mm X 5 mm) and placed at the centre of the crystallising dish. Then five triatomine bugs were allowed to feed *ad libitum* for 1 hour. We registered the time between initial feeding and defaecation for every insect or defaecation latency time (DLT). Once the insect defecated it was removed from the arena. The procedure was repeated three times for each series (species, sex).

**Statistical analysis.** Bioassay results were analysed by two-way analysis of variance (ANOVA, GLM procedure[10]) and the Ryan-Einot-Gabriel-Welsch multiple F or REGWF test11. In all cases **a= 0.05.** All analysis employed SAS computer software.[10]

## RESULTS

*R. prolixus* both male and female had the shortest defaecation latency time (DLT), female *T. picturata* and male *T. phyllosoma* had the longest DLT, the other six species had intermediate DLT values (Table 1 and Fig. 1).

## DISCUSSION

A triatomine bug may be considered a vector of *T. cruzi* to man depending on several aspects: a) preference for blood source b) contact insect-man c) insect survival d) bug density in human premises, and e) defaecation pattern.[6]

Laboratory studies on triatominae vectorial capacity may contribute to a better understanding of the role of different bug species on *T. cruzi* transmission, on phylogenetic relationships and evolutive trends.[9] Also they have provided useful information for management purposes. We know, for example, that in some areas *T. rubrofasciata* with long DLT colonises houses where *T. infestans* has been removed by spraying.[1] On the other hand *T. sordida* a species still in the process to adapting to human houses,[5] has a short DLT; thus it is considered as good vector as *T. infestans.*[3] Considering that the amount of ingested blood and fasting periods are inversely related to bug density in a home, at low densities, the risk of *T. cruzi* transmission may increase. Therefore,[13] proposed that we should increase control procedures after spraying a house.

There are several publications on defaecation dynamics in triatominae species. However it is difficult to compare and integrate their results due to differences in experimental procedures.[15, 16, 17] In this work we standardised the experimental conditions and procedures, yet the question remains on the possibility of differential effects of standard conditions for different species.

Our results confirm previous reports,[4,7,8,17] indicating that compared to other species, *R. prolixus* and *T. infestans* defecate shortly after initial feeding. Among Mexican triatomine species only *T. lecticularia* shows no significance compared to *R. prolixus* and *T. infestans* (Fig. 1). According to the statistical analysis, these three species constitute one group. A second intermediate "group" includes *T. barberi* with a twofold DLT compared to the first group, and a third group with *T. dimidiata* and larger size species in the "phyllosoma" complex (*T. pallidipennis, T. phyllosoma* and *T. picturata*).

Body size does not come up as a factor, small *T. barberi* shows DLT's close to those of species like *T. pallidipennis* (twice as big).

Consistently with previous reports,[3,16,17] and as a gen-

Table 1. Defaecation latency time (minutes) in adults of eight species of triatomine bugs from Mexico.

| Species | Female | Male | Total |
|---|---|---|---|
| *Rhodnius prolixus* | 3.4 ± 0.6 | 6.3 ± 1.0 | 9.8 + 1.6 |
| *T. infestans* | 9.7 ± 1.4 | 11.6 ± 1.5 | 21.3 ± 2.8 |
| *T. lecticularia* | 11.0 ± 2.1 | 10.8 ± 2.4 | 21.8 ± 4.3 |
| *T. barberi* | 20.1 ± 2.6 | 25.5 ±.3.4 | 45.7 ± 5.9 |
| *T. dimidiata* | 25.9 ± 4.0 | 30.4 ± 3.41 | 56.33 ± 7.1 |
| *T. phyllosoma* | 31.2 ± 7.1 | 39.3 ± 1.4 | 70.1 ± 3.1 |
| *T. pallidipennis* | 30.8 ± 3.6 | 34.7 ± 1.7 | 65.5 ± 5.0 |
| *T. picturata* | 33.3 ± 2.8 | 34.6 ± 2.5 | 67.9 ± 4.9 |

Mean and standard error of mean, three repetitions (n = 15).

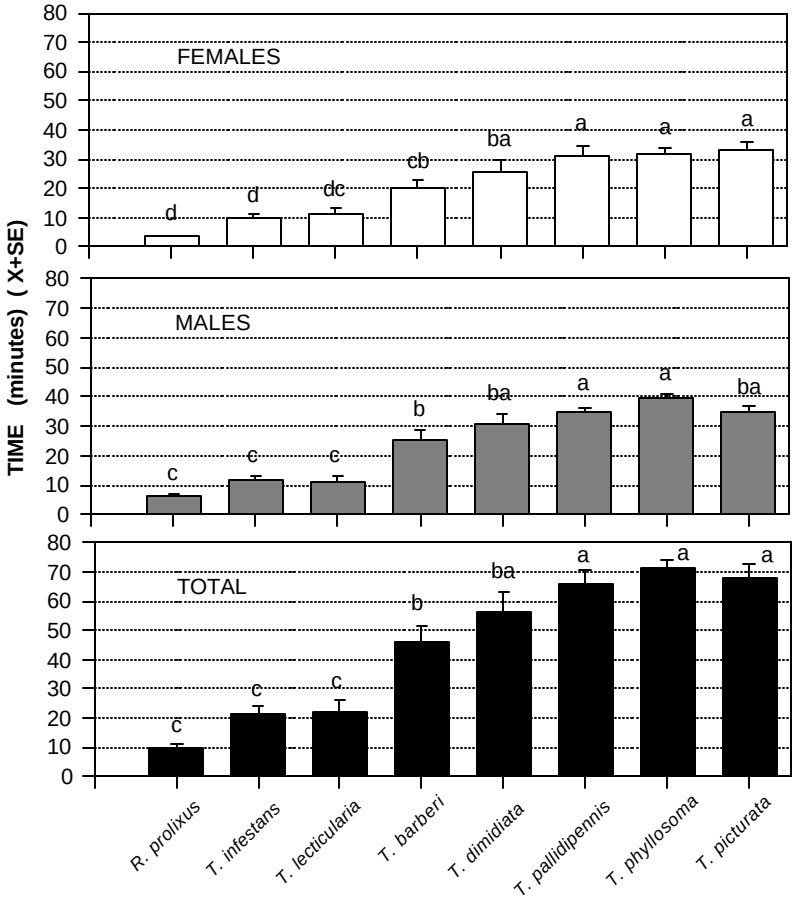


Fig. 1. Defaecation latency time (minutes) in adults of eight species of triatomine bugs from Mexico. Bars with the same letter are not significantly different. Ryan-Einot-Gabriel-Welsch multiple F test, $P< 0.05$

eral trend, females defecate faster compared to males, the only exception being *T. lecticularia*.

We conclude that from the triatominae bugs under study, *R. prolixus* and *T. lecticularia* may be considered as highly efficient vectors of *T. cruzi*, followed by *T. barberi* and *T. dimidiata*. The three species in the phyllosoma complex represent a minor risk for disease transmission due to their longer DLT's.

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