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# Are the populations of *Triatoma infestans* from Santiago del Estero, Argentina, resistant to pyrethroids?

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## Introduction

Chagas Disease is caused by the parasitic protozoan parasite *Trypanosoma cruzi*. Around 70 million people in the region of the Americas are at risk for Chagas Disease and approximately 5.7 million are infected annually, causing 12,000 deaths per year. Moreover, 21 countries in the region are endemic for Chagas Disease with an annual incidence of 28,000 cases. *T. cruzi* is transmitted by the infected feces of blood-sucking bugs of the subfamily Triatominae, by blood transfusions and organ transplants from infected donors, vertically from an infected mother to child during pregnancy or childbirth, orally by the accidental ingestion of food contaminated with *T. cruzi* (PAHO/WHO webpage).

In Argentina, the main vector for this disease is *Triatoma infestans*. In the last decades, triatomine bugs in Argentina were controlled through the use of pyrethroids like deltamethrin, alphamethrin, cypermethrin, λ-cyhalothrin, β-cyfluthrin and β-cypermethrin. The continuous use of these insecticides has exerted a strong selective pressure that has led to the appearance of resistant insects in focal areas of the country. In Argentina, the first record of chemical control failures for triatomines caused by high levels of resistance to pyrethroids were from samples collected in Salvador Mazza, Salta province (Picollo *et al.*, 2005).

The monitoring of resistance to insecticides in *T. infestans* was started in 2014, as part of a program for entomological vector surveillance and control of *T. infestans* that Mundo Sano implements since 2002 in urban and surrounding rural areas of Añatuya (Santiago del Estero, Argentina).

The objective of adding this component was to evaluate the susceptibility of *T. infestans* samples from rural areas of Añatuya to the pyrethroid deltamethrin, active ingredient found in the most widely used formulations for triatomine control.

## Materials and methods

Triatomines were collected in the field during the routine house visits performed as part of Mundo Sano´s program for entomological vector surveillance and control in rural communities (Fig. 1). After the collection, the insects were identified and sent to the Research Center for Pests and Insecticides (Centro de Investigación de Plagas e Insecticidas – CIPEIN) where they were bred per strain.



Figure 1. Entomological surveillance

The bioassays performed followed the World Health Organization's protocol for the evaluation of the effect of insecticides on triatomine bugs (WHO 1994). Reared F1 generations (Fig. 2) were evaluated against the discriminant dose (DD) of deltamethrin of 2 ng/insect (Fig. 3). Mortality was evaluated 24 hours after topical application of the DD and three independent assays were performed for each rural strain. Strains from CIPEIN (negative – susceptible to deltamethrin) and La Pista (positive – resistant to deltramethrin) were used as controls. Possible resistance was considered when survival was observed in at least one insect in two of every three independent assays.



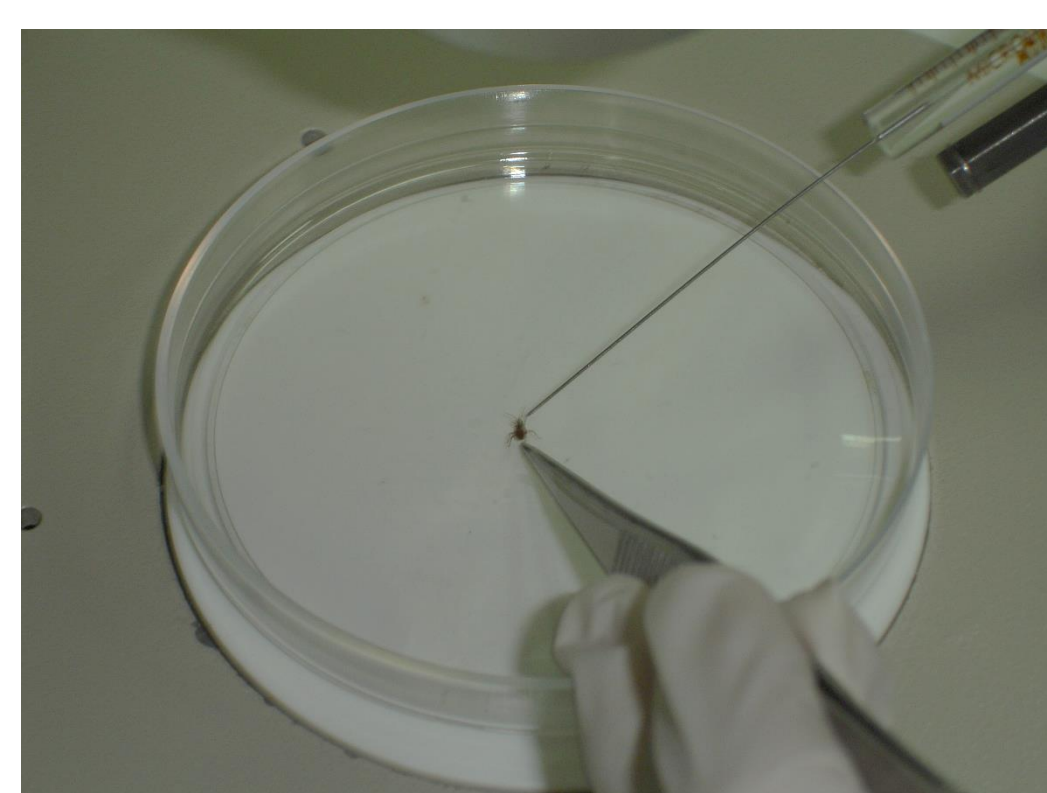Figure 2. F1 generation of *Triatoma infestans*



Figure 3. Topical application of the DD

## Results

The tables detail the percent mortality found in each rural strain during 2014 (Table 1), 2015 (Table 2) and 2016 (Table 3). In general, the triatomine populations collected were less sensitive to the insecticide than the negative control (CIPEIN). Tables 2 and 3 show that the insects from Miel de Palo were resistant to deltamethrin.

Table 1. Percent mortality in 2014

| Strains | % Mortality |
|---|---|
| CIPEIN | 100 |
| El Desvío | 71 |
| Lote 47 (R1) | 30 |
| Lote 47 (R2) | 50 |
| Lote 47 (R3) | 35 |
| La Pista | 0 |

Table 2. Percent mortality in 2015

| Strains | % Mortality |
|---|---|
| CIPEIN | 100 |
| Sportivo | 75 |
| El Desvío (R1) | 100 |
| El Desvío (R2) | 86 |
| Miel de Palo | 70 |
| La Pista | 0 |

Table 3. Percent mortality in 2016

| Strains | % Mortality |
|---|---|
| CIPEIN | 100 |
| Miel de Palo (R1) | 67 |
| Miel de Palo (R2) | 11 |
| Miel de Palo (R3) | 52 |
| La Pista | 0 |



## Discusion and conclusions

The DD did not result in a mortality rate of 100% of the F1 generations reared in the lab from each of the rural communities included in the study. Furthermore, the assay performed in 2016 confirms the results obtained in 2015 for the population of triatomine bugs collected from the community of Miel de Palo.

These results meet the criteria established in the WHO protocol which considers the existence of resistance to insecticides as "the repeat survival of the treated insects in at least two of the three assays" (WHO, 1994). Therefore, the individual triatomine bugs collected from Miel de Palo continue to be reared in the laboratory in order to evaluate the grade of resistance of the population.

Finally, these results highlight the importance of continuing the monitoring of the populations of *T. infestans* since the current entomological control of this species in Argentina is based on the use insecticide formulations that contain pyrethroids as the active ingredient.

## Reference

Picollo MI, Vassena C, Santo Orihuela P, Barrios S, Zaidemberg M, Zerba E. 2005. High resistance to pyrethroid insecticides associated with ineffective field treatments in *Triatoma infestans* (Hemiptera: Reduviidae) from Northern Argentina. *J Med Entomol*. 42(4):637-42.

WHO - World Health Organization. 1994. Protocolo de evaluación de efecto insecticida sobre triatominos. *Acta Toxicol Arg* 2: 29-32

www.paho.org/hq/index.php?option=com_content&view=article&id=5856&Itemid=41506&lang=en (Accessed on september 2016)