

Elimination of *Rhodnius prolixus* in El Salvador, Central America

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Epidemiological studies performed in El Salvador between 1955-1972 demonstrated a high frequency of two triatomine vectors (Triatoma dimidiata and Rhodnius prolixus). However, the frequency of R. prolixus decreased by 1976 and this species has not been found since 1995. The main factors influencing the elimination of R. prolixus in El Salvador are discussed in this paper.

Key words: *Rhodnius prolixus* - elimination - El Salvador - Central America

Chagas disease has been known in Central America since 1913 when the first human case was reported in El Salvador (Segovia 1913), though El Salvador was the second country in Latin America to report cases of this disease after its discovery by Carlos Chagas in Brazil (Chagas 1909). *Rhodnius prolixus* (Stål, 1859) was first detected in El Salvador by a Brazilian investigator (Neiva 1915), apparently among specimens sent by Segovia for identification, and this vector most likely originated from Venezuela (Zeledón 1972, 2004, Dujardín et al. 1998, Schofield & Dujardín 1999). The insect is exclusively domestic and is well adapted to thatch and straw dwellings located at elevation below 800 m in El Salvador; thus, eliminating this type of housing can reduce the population size of this insect. In addition, *R. prolixus* is susceptible to the insecticides used in antimalarial programmes. The progressive reduction in the frequency of *R. prolixus* relative to the frequency of *Triatoma dimidiata*, the causative agent of Chagas disease, in El Salvador is shown in Table. The decrease is expressed by the mean number of triatomine insects collected during several studies performed between 1955-2010 (Peñalver et al. 1957, Cedillos et al. 1976, 2002, Romero et al. 2011).

The following are among the reasons for the elimination of *R. prolixus* in El Salvador: (i) the reduction in the percentage of straw huts, a natural habitat for this vector in this country, from 32.9% in 1971 to 0.5% in 2007, (ii) the use of insecticides for malaria control - houses that had been sprayed with DDT or propoxur up to 20 months before the survey in 1976 were found to be negative for triatomines, in comparison with an

infestation rate of 50% reported in houses that were never subjected to insecticide treatment, (iii) the land reform in 1989, which favoured the building of adobe or brick houses in rural areas, and (iv) the remittances sent by Salvadoran immigrants from the United States of America and other countries around the world, estimated at one to three billion dollars annually since 1980, which allowed many families to improve the construction of their houses.

In 2008, Guatemala became the first country in Central America to be certified by the Initiative of the Countries of Central America for Control of Vector-Borne and Transfusional Transmission and Medical Care for Chagas Disease (IPCA) as having interrupted the transmission of Chagas disease by *R. prolixus*. In 2011, Honduras and Nicaragua were also in the process of eliminating the disease transmission due to this vector (Hashimoto & Schofield 2012). Despite the improvements regarding *R. prolixus*, the current situation for *T. dimidiata*, a native species found in all Central American countries in domestic, peridomestic habitats and even urban areas, presents a permanent challenge to the control strategy for Chagas disease in the area. The elimination of *T. dimidiata* is not feasible, but the reduction of domestic infestation is a viable target (Ponce 2007). In El Salvador, significant progress in controlling *T. dimidiata* is being achieved through a massive insecticide-spraying program with community participation and health promotion. This program resulted in a reduction in the percentage of infested houses from 60% in 2003 when the control program started to 40% in 2007 and 2.5% in 2011 in the areas under surveillance and control. The number of acute cases of Chagas disease in the country also declined from 117 cases in 2006 to 16 cases in 2010 (Romero et al. 2011).

The elimination of *R. prolixus* was validated by the XII Meeting of the Central American Initiative of Chagas Disease Control held in San Salvador in June 2010. At this meeting, El Salvador was formally declared free of Chagas disease transmission due to this vector.

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TABLE
 Triatomines collected by several studies performed in El Salvador, Central America, 1957-2010, showing the distribution of *Triatoma dimidiata* and *Rhodnius prolixus*

Year	House surveys (n)	Domestic infestation rate (%)	<i>T. dimidiata</i> collected n (%)	<i>R. prolixus</i> collected n (%)	Total collected (n)
1957	1,102	26.3	2,525 (51.8)	2,346 (48.2)	4,871
1972	1,388	81.1	1,972 (30.8)	4,439 (69.2)	6,411
1976 ^a	271	38.9	228 (81.7)	51 (18.3)	279
1995	2,041	24	4,920 (100)	0 (0)	4,920
2000 ^a	1,229	20.9	1,319 (100)	0 (0)	1,319
2010	17,359	14	3,457 (100)	0 (0)	3,457

a: statistical sample surveys.

REFERENCES

Cedillos RA, Francia H, Soudy-Call J, Ascencio G, Valcárcel-Novo M 2002. Estudio epidemiológico de la infección por *Trypanosoma cruzi* en El Salvador, Centro América. Available from: cic.ues.edu.sv/2/1/22-32.

Cedillos RA, Warren McW, Jeffery GM, Wilton DP, Sauerbrey M 1976. Estudio epidemiológico de *Trypanosoma cruzi* en El Salvador, Centro América. *Rev Inst Invest Med* 5: 119-130.

Chagas C 1909. Nova tripanozomíaze humana: estudos sobre a morfologia e o ciclo evolutivo do *Schizotrypanum cruzi* n. gen., n. sp.,

agente etiológico de nova entidade morbida do homem. *Mem Inst Oswaldo Cruz* 1: 159-218.

Dujardín JP, Muñoz M, Chávez T, Ponce C, Moreno J, Schofield CJ 1998. The origin of *Rhodnius prolixus* in Central America. *Med Vet Entomol* 12: 113-115.

Hashimoto K, Schofield CJ 2012. Elimination of *Rhodnius prolixus* in Central America. *Parasit Vectors* 5: 45.

Neiva A 1915. Contribuição para o conhecimento dos hemípteros hematófagos da América Central. *Brasil Med* 29: 1-3.

Peñalver JM, Rodríguez MI, Bloch M, Sancho G 1957. Tripanosomiasis en El Salvador. *Arch Col Med El Salv* 10: 1-21.

Ponce C 2007. Current situation of Chagas disease in Central America. *Mem Inst Oswaldo Cruz* 102 (Suppl. 1): 41-44.

Romero Chévez JE, Ramos HR, Sasagawa E 2011. *Avances hacia la interrupción de la transmisión de la enfermedad de Chagas en El Salvador 2003-2010*, OPS/OMS, MINSAL JICA, UES, El Salvador, 64 pp.

Schofield CJ, Dujardín JP 1999. Theories in the evolution of *Rhodnius prolixus*. *Actualid Biol Medellín* 21: 183-197.

Segovia JC 1913. Un caso de tripanosomiasis. *Archivos Hospital Rosales (San Salvador)* 8: 249-254.

Zeledón R 1972. Los vectores de la enfermedad de Chagas en América. In *Simposio Internacional sobre Enfermedad de Chagas*, Sociedad Argentina de Parasitología, Buenos Aires, p. 327-345.

Zeledón R 2004. Some historical facts and recent issues related to the presence of *Rhodnius prolixus* (Stål 1859) (Hemiptera: Reduviidae) in Central America. *Entomol Vect* 4: 233-246.