Trypanosoma cruzi infection in *Triatoma infestans* and other triatomines: long-term effects of a control program in rural northwestern Argentina

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ABSTRACT *The prevalence of* Trypanosoma cruzi *infection in* Triatoma infestans, Triatoma guasayana, *and* Triatoma sordida *was evaluated in Amamá and other neighboring rural villages in northwestern Argentina for five years after massive spraying with deltamethrin in 1992 and selective sprays thereafter. Local residents and expert staff collected triatomines in domiciliary and peridomestic sites. During 1993–1997, the prevalence of* T. cruzi *was 2.4% in 664* T. infestans, *0.7% in 268* T. guasayana, *and 0.2% in 832* T. sordida. T. cruzi *infection was more frequently detected in adult bugs and in triatomines collected at domiciliary sites. The infected* T. guasayana *and* T. sordida *were nymphs and adults, respectively, captured at peridomestic sites. The prevalence of* T. cruzi *infection in* T. infestans *decreased from 7.7% to 1.5% during the surveillance period, although that change was not statistically significant. Comparison of* T. infestans *infection rates before the control program and during surveillance showed a highly significant decrease from 49% to 4.6% in bedrooms, as well as a fall from 6% to 1.8% in peridomestic sites. Because of its infection with* T. cruzi *and frequent invasion of domiciliary areas and attacks on humans and dogs,* T. guasayana *appeared implicated as a putative secondary vector of* T. cruzi *in domestic and peridomestic sites during the surveillance period.* T. sordida *was the most abundant species, but it was strongly associated with chickens and showed little tendency to invade bedrooms.*

Triatoma infestans, the main vector of *Trypanosoma cruzi*, is currently the subject of an elimination program through the massive spraying of residual insecticides as part of the Southern Cone Initiative, which includes the countries of Argentina, Bolivia, Brazil, Chile, Paraguay, Peru, and Uruguay (1). In Argentina, controlling *T. infestans* in the province of Santiago del Estero, in the northwestern part of the country, has been historically difficult (2). Young men from the province have had nearly the highest rate of seropositivity for *T. cruzi* among those drafted into military service in Argentina (3). In a five-year follow-up of rural villages in Santiago del Estero after a single massive spray of deltamethrin and selective treatments thereafter, *T. infestans* was not eliminated locally but its abundance was reduced to very low levels in bedroom areas (4, 5). Peridomestic sites were the principal source of *T. infestans* and the origin of domiciliary reinfestations. In this study we describe the initially sharp and then sustained decline in the prevalence of *T. cruzi* in *T. infestans* as a consequence of the control program.

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Several species of sylvatic or peridomestic triatomines that are not control targets at present might turn into secondary vectors of *T. cruzi* during or after the elimination of *T. infestans* (6). In the Southern Cone, *Triatoma sordida* and *Triatoma guasayana* have been considered potential candidates to replace *T. infestans* in the domestic environment (7–9). It is not known if those triatomines maintain or contribute to the transmission of *T. cruzi* in domiciliary and peridomestic sites when *T. infestans* populations are absent or exist in only small numbers.

The prevalence of *T. cruzi* infection in domiciliary populations is closely connected to the risk of human infection. Bug infection rates depend on the prevalence rates of human and mammal infection and the level of contact between hosts and vectors (10). Part of a wider project, this study had two objectives: 1) assessing the long-term effects of control actions on the prevalence of *T. cruzi* in *T. infestans* populations from domiciliary and peridomestic sites and 2) evaluating the importance of *T. sordida* and *T. guasayana* in peridomestic or domestic sites as vectors of *T. cruzi* during the surveillance phase. These results contribute to understanding the dynamics of transmission of *T. cruzi* by primary and secondary triatomine vectors during the surveillance phase.

The effects that the control program had on house recolonization by *T. infestans* and seropositivity for *T. cruzi* in the human population will be reported elsewhere.

MATERIALS AND METHODS

Study area

Field studies were carried out in five rural villages in the province of Santiago del Estero, Argentina: Amamá, Trinidad, Mercedes, Villa Matilde, and Pampa Pozo (27° S, 63° W). Previous articles described the area and its history of infestation by *T. infestans* (5, 11). Amamá is located on a paved road, 6–10 km from the other villages. Those villages consist of two geographic clusters, Trinidad-Pampa Pozo and Mercedes-Villa Matilde, which are connected with each other by dirt roads.

Homes in the study communities typically had adobe walls, a thatched roof, one or two bedrooms, and a front porch. Such a dwelling covered by a single roof defined the domiciliary ("bedroom") area. In the cases where a storeroom or a kitchen shared the same roof as a bedroom, those spaces were also considered part of the domiciliary area since there was no absolute separation between these adjacent rooms. The peridomestic area consisted of the patio; storerooms, kitchens, pens, and other structures that were not connected to the roof that was over the bedrooms; and other potential vector hiding places located within the area of human activity, including trees, pieces of wood, etc.

Entomologic methods

Before the October 1992 spraying campaign, in March of that year, two experts from the National Chagas Service (NCS) searched all the houses in Amamá, Trinidad, and Mercedes for live *T. infestans*. The experts spent 30 min per house in the bedroom area (one person-hour total per house) and 10 min per house in peridomestic sites (1/3 person-hour total per house) (5, 12). Searches were assisted with a flushing-out agent (0.2% tetramethrin, Icona®, Buenos Aires). Findings of *T. guasayana* and *T. sordida* in peridomestic sites were disregarded because these species were not considered control targets at that time. After the deltamethrin spraying in October (see "Control actions" below), local residents and research team members collected the triatomines knocked down during the first 24 h after treatment. These bugs provided further evidence of house infestation and served as samples to estimate bug infection rates.

In mid-December 1992, an average of three (range, two to five) sensor boxes (Biosensor Detector de Vinchucas, Biocientifica de Avanzada®, Buenos Aires) were placed indoors or on the porch of each house to monitor reinfestation by triatomine bugs, as described elsewhere (5). All the sensing devices were inspected for evidence of bug infestation every six months from May 1993 through December 1997. Every 12 months from October 1993 through December 1997 three skilled bug collectors from the NCS searched for triatomines in the bedroom areas and in the peridomestic areas using 0.2% tetramethrin as before. Peridomestic structures were 4–100 m away from the bedrooms (i.e., domiciliary areas) and included kitchens, storerooms, goat and pig pens, and other likely refuges for triatomines. For 30 min per house, two men searched the bedrooms (one person-hour total per house) while another man searched peridomestic sites (1/2 person-hour per house). Additional searches for bugs were carried out at peridomestic sites each May from 1995 through 1997. Beginning in May 1993, each household received labeled self-sealing plastic bags to keep any triatomine that the residents captured in domiciliary or peridomestic sites. At each six-month visit, residents were asked for the bugs they had collected and for information on where they had captured them. However, since most of the triatomines the residents collected were dead when the research team received them, these bugs were not examined for infection. The finding of at least a *T. infestans* nymph was taken as an indication of colonization.

The number, stage, location, and species of triatomine collected at each house in each survey was recorded on independent data sheets. At the field laboratory, all the bugs were later identified by species and stage, using standard keys (13, 14). Live or moribund triatomines were individually examined for *T. cruzi* infection within 10–15 days of capture, except in December 1997, when feces from three *T. guasayana* and *T. sordida* collected at the same site were examined in pools. When a positive pool was detected, the bugs were reexamined individually. In December 1997, extra efforts were made to examine as many bugs as possible. Fecal drops obtained by abdominal compression from each bug were diluted with one drop of saline solution, covered with a 22x22-mm cover slip, and thoroughly examined at 400x magnification for active trypanosomes. *T. cruzi* and *Blasthocrithidia* sp. were diagnosed on the basis of their morphology.

Control actions

In mid-October 1992, following standard procedures, NCS staff sprayed all 93 existing houses in Amamá, Trinidad, and Mercedes and their peridomestic outbuildings with deltamethrin (2.5% suspension concentrate at 25 mg a.i./m^2 of sprayed surface). After that, searches for residual foci were carried out, as were selective insecticide treatments (4). The neighboring villages of Villa Matilde and Pampa Pozo, totaling 13 houses, were added to the study after being sprayed with deltamethrin between October 1993 and May 1994.

From 1993 to 1995, all sites with *T. infestans* nymphs, but not other triatomines, were treated focally with deltamethrin as before. For example, when a goat pen was found recolonized by *T. infestans*, only this site was treated. The first treatment during the surveillance phase was carried out in peridomestic sites of a house in late 1993.

In November 1995, an additional step in the control process was taken, assessing if there were still any bugs in the houses with triatomine dejecta in the sensing devices. The measure may also have contributed to controlling any triatomine reinfestation in the bedrooms. The 31 houses that had had triatomine fecal smears in the sensor boxes in the preceding 12 months or where the residents reported the bedrooms as infested were treated with one or two insecticide (deltamethrin, γ-BHC and DDVP) fumigant canisters (Agufog, Aguvac®, Buenos Aires) per bedroom. Two houses too open for effective treatment with fumigant canisters were sprayed with deltamethrin. Additional sprayings were carried out in peridomestic sites at 8 homes, in the bedrooms of 1 house, and in both areas at another house.

A progressive transfer of surveillance activities from the research team to the affected communities started in November 1995. Three four-hour workshops were conducted in the schools of Amamá and Mercedes, in November 1995, May 1996, and November 1996. In these workshops, local residents were briefed on the main results of the research project. They also learned how to assemble and inspect sensor boxes, apply fumigant canisters, and spray their homes and outbuildings with insecticide. Members of 47 of 51 families (92%) from Amamá and 43 of 54 families (80%) from the other villages participated in at least one of the workshops. Each geographic cluster chose a member who would receive notifications of *T. infestans* captures, store the insecticide and sprayer, keep records, and help affected families treat their homes. The elected leaders were three men 30–45 years old, two of whom already held one of the scarce paid permanent jobs with the provincial government, but doing some other kind of work.

During 1996, deltamethrin spraying was done in the bedrooms of 16 houses, in peridomestic sites at 3 houses, and at both those locations at 4 houses. In addition, fumigant canisters were applied in 4 other houses.

In 1997, deltamethrin sprayings were done in bedrooms at 7 houses, plus in both the bedrooms and the peridomestic sites at 13 other houses.

Statistical analysis

The relationships between infection with *T. cruzi* (the dependent variable) and survey year were studied by maximum likelihood logistic regression analysis using the logistic-binomial model for indistinguishable data from EGRET software (15). Logistic regression analysis was chosen instead of standard linear regression because the data for *T. cruzi* infection are binary for an individual bug, and for a sample of bugs yield fractions between 0.0 and 1.0 that tend to have a binomial distribution. Infected was indexed as 1, and noninfected as 0. Survey years were enumerated from 1 to 5.

RESULTS

Of 1 764 triatomines examined for infection during 1993–1997, only 20 bugs (1.1%) were infected with *T. cruzi* (Table 1). Over that period, the prevalence of *T. cruzi* was 2.4% in *T. infestans*, 0.7% in *T. guasayana*, and 0.2% in

TABLE 1. Prevalence of *Trypanosoma cruzi* in *Triatoma infestans, Triatoma guasayana,* and *Triatoma sordida* by site of capture, Amamá, Argentina, and neighboring villages, 1993–1997

Species	Domiciliary sites				Peridomestic sites				Total			
	Number captured	Number examined	Number infected	% infected	Number captured	Number examined	Number infected	% infected	Number captured	Number examined	Number infected	% infected
T. infestans	447	153	7	4.6	767	511	9	1.8	1 214	664	16	2.4
T. guasayana	128	12	0	0	619	256	2[a]	0.8	747	268	2	0.7
T. sordida	19	2	0	0	1 440	830	2[b]	0.2	1 459	832	2	0.2
Total	594	167	7	4.2	2 826	1 597	13	0.8	3 420	1 764	20	1.1

[a] Two infected fifth-instar nymphs of *T. guasayana*.
[b] Two infected male *T. sordida*.

TABLE 2. Prevalence of *Trypanosoma cruzi* in *Triatoma infestans, Triatoma guasayana,* and *Triatoma sordida* by instar, Amamá, Argentina, and neighboring villages, 1993–1997

	Percentage of infected bugs by instar											
	Second/Third			Fourth			Fifth			Adults		
Species	Number examined	Number infected	% infected	Number examined	Number infected	% infected	Number examined	Number infected	% infected	Number examined	Number infected	% infected
T. infestans	179	0	0	120	1	0.8	144	2	1.4	221	13	5.9
T. guasayana	23	0	0	42	0	0.0	161	2	1.2	42	0	0.0
T. sordida	49	0	0	75	0	0.0	277	0	0.0	431	2	0.5
Total	251	0	0	237	1	0.4	582	4	0.7	694	15	2.2

T. sordida, and differed significantly among species, according to the chi-square test ($\chi^2 = 15.9$, degrees of freedom [df] = 2, $P < 0.001$). The percentage of infection was significantly greater for *T. infestans* collected in domiciliary sites (4.6%) than in peridomestic sites (1.8%) ($\chi^2 = 3.96$, df = 1, $P = 0.046$). The 20 infected triatomines were collected at 15 different houses; a single infected bug was captured at each of 12 houses, 2 infected bugs at each of 2 houses, and 4 infected bugs at a single house over a period of two surveys. *Blastocrithidia* sp. was detected in 1 female *T. guasayana* and 2 male *T. sordida*.

Triatoma infestans was the only species infected with *T. cruzi* in bedroom areas (Table 1). Nearly half (7/16) of all the infected *T. infestans* were collected there (in one case, two infected bugs were found in a single home). Three of these six findings of infected *T. infestans* in bedroom areas were isolated adults captured in houses that had no evidence of current or subsequent domiciliary colonization, therefore suggesting recent immigration from elsewhere. In peridomestic sites, six of the seven findings (86%) of infected *T. infestans* occurred in sites colonized by this species at the time of capture. The infected peridomestic *T. infestans* were caught in two different kitchens, a storeroom, a patio, a bathroom, a goat pen, and a timber pile. These seven findings comprised nine infected *T. infestans* bugs because three bugs were found at a single residence.

Trypanosoma cruzi was detected in 15 adults, 4 fifth-instar nymphs, and 1 fourth-instar nymph (Table 2). In *T. infestans*, the prevalence of *T. cruzi* infection steadily increased from 0.0% in second- and third-instar nymphs to 5.9% in adult bugs. Only 2 *T. guasayana* fifth-instar nymphs (captured in May 1995 in a chicken nest made with piled branches and pieces of clothing) and 2 *T. sordida* males (captured in 1996 and 1997, in a pig pen and a tree where chickens roosted) were infected with *T. cruzi* (Table 2). These 4 all came from peridomestic colonies of the respective species in Amamá.

The overall prevalence of *T. cruzi* infection in *T. infestans* decreased from 7.7% in 1993 to 1.5% in 1997 (Table 3), though the change was not statistically significant ($\chi^2 = 2.96$, df = 1, $P = 0.086$). Bug infection rates did not differ significantly among Amamá (3%), Trinidad-Pampa Pozo (3%), and Mercedes-Villa Matilde (1%) ($\chi^2 = 3.4$, df = 2, $P = 0.18$). Infected *T. infestans* were found in five of eight surveys during the surveillance period in Amamá, in two surveys during the third and fourth year after spraying in Trinidad-Pampa Pozo, and only once during the fourth year after spraying in Mercedes-Villa Matilde. All 13 houses in Villa Matilde and Pampa Pozo and a logging operation near Trinidad were found infested by *T. infestans* in 1993, and none had been sprayed with insecticides. The prevalence of *T. cruzi* in the domiciliary *T. infestans* (24/84, or 29%) found in these 13 unsprayed houses was significantly higher than

TABLE 3. Prevalence of *Trypanosoma cruzi* in *Triatoma infestans* by village during surveillance, Amamá, Argentina, and neighboring villages, 1993–1997

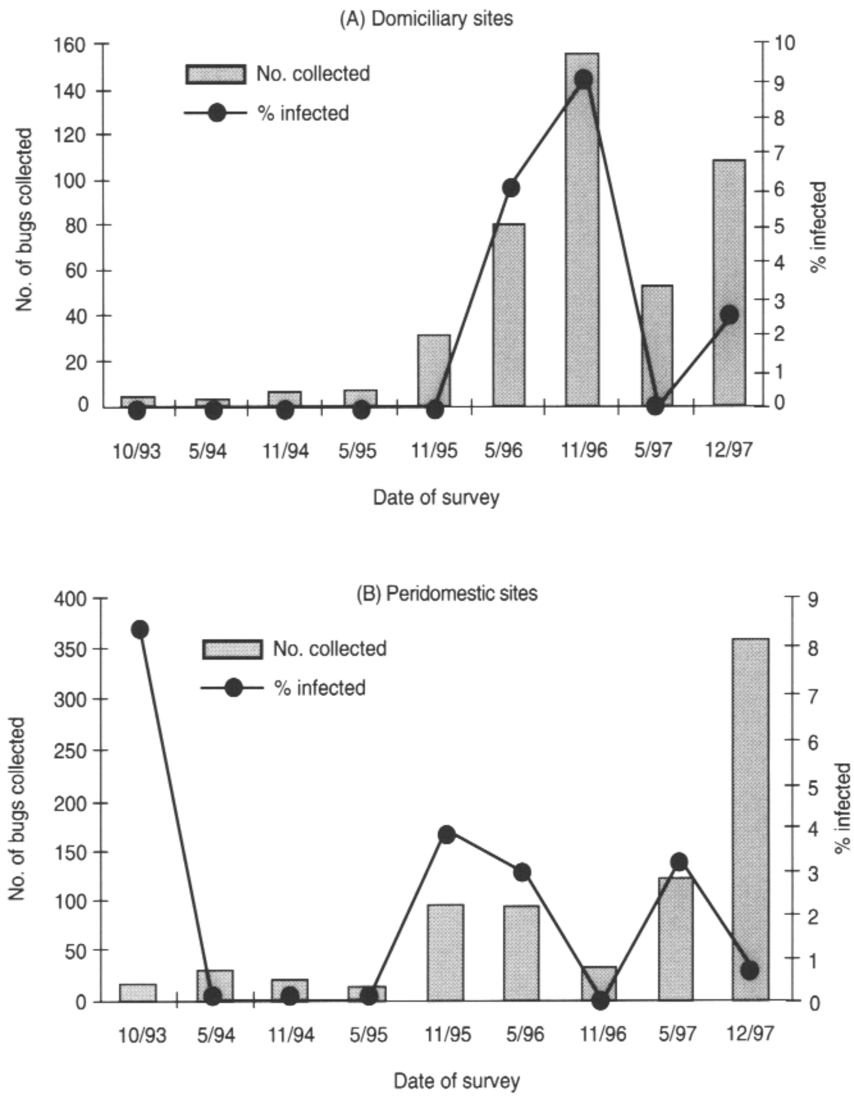
	Amamá				Trinidad-Pampa Pozo				Mercedes-Villa Matilde				Overall
Survey dates	Number captured	Number examined	Number infected	% infected	Number captured	Number examined	Number infected	% infected	Number captured	Number examined	Number infected	% infected	% infected
1993	10	10	1	10	4	3	0	0	1	0	—	—	7.7
1994	7	2	0	0	42	3	0	0	1	0	—	—	0
1995	21	16	0	0	60	15	2	13	64	29	0	0	3.3
1996	74	36	3	8	48	13	2	15	238	78	1	1	4.7
1997	424	304	7	2	125	87	0	0	95	68	0	0	1.5
Total	536	368	11	3	279	121	4	3	399	175	1	1	2.4

what was found in the domiciliary sites of the study villages over the five-year period (4.6%) (χ^2 = 27.5, df = 1, P < 0.001).

The percentage of *T. cruzi*-infected *T. infestans* correlated positively and significantly with the log-transformed total number of *T. infestans* collected in bedroom areas (r = 0.72, n = 9, P < 0.05), but not in peridomestic sites (r = –0.03, n = 9, P > 0.1) (Figure 1).

Figure 2A compares the prevalence of *T. cruzi* in *T. infestans* from Amamá and the four other control program villages before the deltamethrin spraying in 1992 and during the triatomine surveillance period of 1993–1997. Bug infection rates decreased significantly from 49% (646/1 316) to 4.6% (7/153) in bedroom areas (χ^2 = 110, df = 1, P < 0.001). In peridomestic sites, rates fell from 6% (19/328) to 1.8% (9/511) (χ^2 = 10.1, df = 1, P < 0.002). The overall prevalence of infection for the two types of sites decreased by a factor of 17, from 40.5% (665/1 644) before spraying to 2.4% (16/664) during the surveillance period. For comparison, Figure 2B shows that in 1984, before Amamá was sprayed with deltamethrin for the first time, the domiciliary *T. infestans* infection rate in the village was 57% (471/833). Without any further control actions, reinfestation levels later recovered, reaching a prevalence rate of infection of 21% (108/514) in 1988–1989 (16).

FIGURE 1. Total catch of *Triatoma infestans* and prevalence of *Trypanosoma cruzi* in *T. infestans* collected in (A) domiciliary and (B) peridomestic sites during surveillance, Amamá, Argentina, and four neighboring villages, 1993–1997



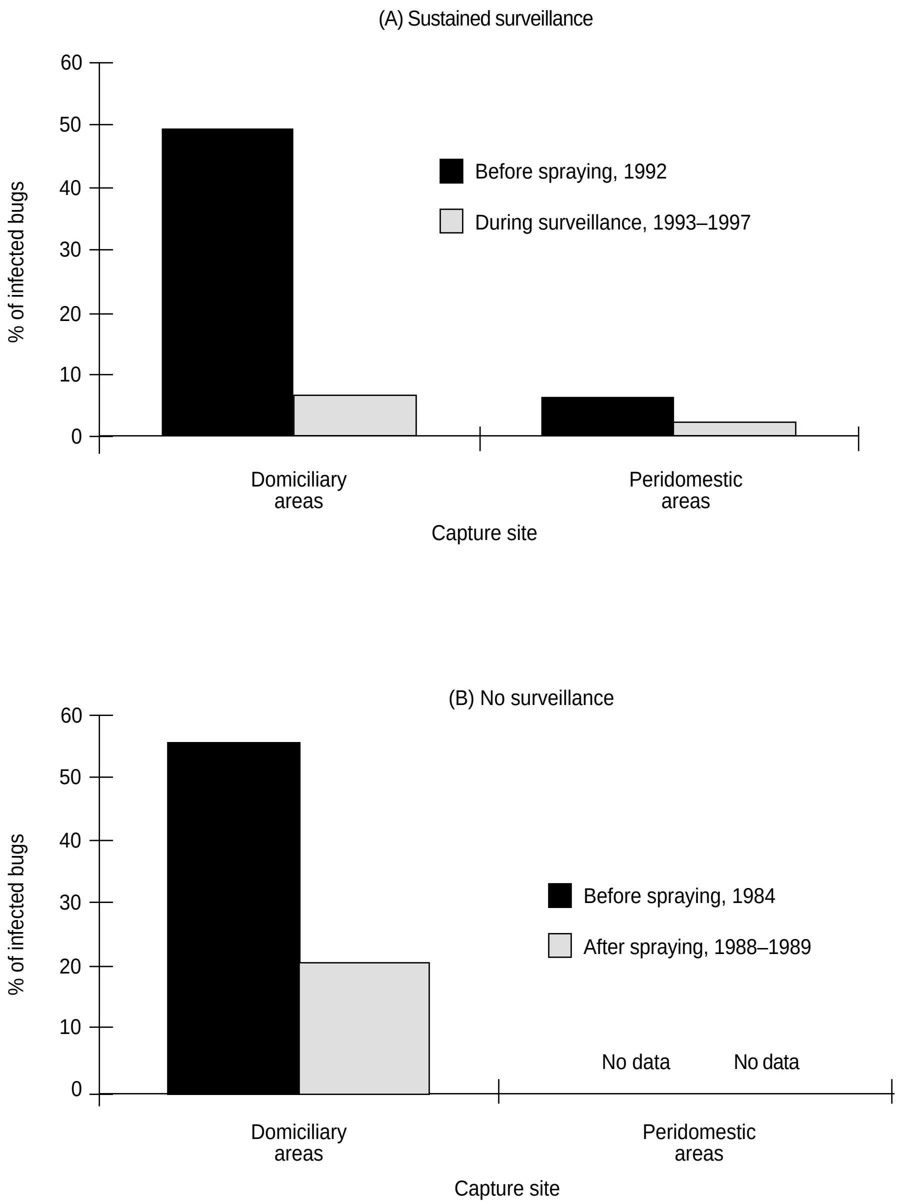
DISCUSSION

Among the main results of this research are that: 1) *T. cruzi* was detected mainly in *T. infestans* in both the domiciliary and peridomestic sites, and marginally in *T. guasayana* and *T. sordida* in peridomestic sites, 2) the control program initially produced a sharp reduction and then a sustained decline in the prevalence of *T. cruzi* in *T. infestans*, and 3) *T. guasayana* appeared implicated as a putative secondary vector of *T. cruzi* in domestic and peridomestic sites during the surveillance phase.

Most triatomines infected with *T. cruzi* were collected in bedroom or peridomestic areas where dogs, cats, and humans rest at night. The source of these triatomine infections may be traced to feeding on infected dogs or cats, which are more infective to bugs than humans are (10). In contrast, all three species of triatomines frequently captured in goat or pig pens and chicken coops were rarely infected with *T. cruzi* in our study area and elsewhere (17).

The impact of the control program on the prevalence of *T. cruzi* in *T. infestans* was greater in domiciliary sites (bug infection rates falling from 49% to 4.6%) than in peridomestic sites (rates falling from 6% to 1.8%). The control program's effectiveness was also reflected in much lower rates of infection by instar during the surveillance period. These low infection rates in both the domiciliary and peridomestic sites were likely associated with low *T. infestans* densities and low rates of domiciliary recolonization as a consequence of selective deltamethrin sprays in the study villages combined with massive sprays in the province of Santiago del Estero. These interventions brought about a steady, very similar decline in the prevalence of dogs seropositive for *T. cruzi* in all five villages, from 65% in

FIGURE 2. Prevalence of *Trypanosoma cruzi* in *Triatoma infestans* captured in domiciliary and peridomestic sites before and after deltamethrin spraying with (A) sustained surveillance in Amamá, Argentina, and four neighboring villages, 1993–1997, and (B) with no surveillance in Amamá only, 1985 vs. 1988–1989 (ratios indicate the proportion of bugs examined that were found to be infected)



1992 to 39% in 1994 and 15% in 1996 (18). Moreover, no autochthonous cases of seroconversion for *T. cruzi* were detected among local children (unpublished results). As a further indication of the impact of sustained surveillance (2), the 4.6% prevalence of *T. cruzi* in domiciliary *T. infestans* achieved in 1993–1997 was nearly 5 times lower than the 21% level of 1988–1989, when there was no surveillance (16). Therefore, even though the control program did not eliminate *T. infestans* and there was even a relative resurgence in 1996–1997, the actions implemented produced a sustained decline in the prevalence of *T. cruzi* in *T. infestans* that was accompanied by a progressive decline in dog and human infection rates. Given that rates of both dog and human seropositivity for *T. cruzi* were nearly the same for all five villages, it remains unclear why infected *T. infestans* were detected more frequently in Amamá than in the other villages and why all the infected *T. guasayana* and *T. sordida* came from Amamá.

Our study shows a direct relationship between the total number of *T. infestans* collected in domiciliary areas in each survey and the percentage of *T. cruzi*-infected *T. infestans* in these samples over time. This finding is in line with data recorded before the spraying campaign, when each house was taken as the unit of analysis (10). Regardless of the underlying mechanism giving rise to such relationships, the clear implication is that reduction of *T. infestans* abundance to low levels involves a decrease in the proportion of infected bugs.

In peridomestic sites, *T. infestans* had a low prevalence of infection both before and during the control program, indicating that *T. cruzi* transmission there had a lower intensity than in bedroom areas. However, the total number of infected triatomines of any species collected in peridomestic sites was nearly double that in the bedrooms, and nearly all of these peridomestic triatomines belonged to established peridomestic colonies. This strengthens the view that the infected bugs likely acquired the infection in those peridomestic ecotopes. *T. infestans* and the other triatomines more rapidly recolonized peridomestic sites than they did bedroom areas. Possible reasons for that may have been that the effectiveness of insecticidal sprays in peridomestic sites was reduced; that the peridomestic area was large and housed an abundant supply of refuges and hosts (4), including dogs and cats; and that the flushing-out method had a reduced sensitivity in complex ecotopes.

Triatoma guasayana was very abundant in peridomestic ecotopes, mainly goat pens, and frequently invaded but did not colonize bedroom areas (5). However, the two infected *T. guasayana* found were nymphs from peridomestic colonies sited 10–30 m away from bedrooms, which makes it unlikely that they came from other houses or sylvatic ecotopes due to the nymph's presumed limited dispersal capacity. Researchers studying peridomestic ecotopes of the village of Trinidad collected a few adult *T. guasayana* dispersing by flying that were infected with *T. cruzi* (19), but the infections may have originated elsewhere. Similarly, in sylvatic ecotopes in and around Trinidad in 1993, after deltamethrin spraying, the prevalence of *T. cruzi* infection in a mixed sample of *T. guasayana* and *T. sordida*, as determined by microscopic examination of feces, was 0.6% (1/164). That prevalence rose to 10.9% when groups of bugs were examined by polymerase chain reaction (PCR) (20). In our study, microscopic examination of triatomine feces likely underestimated the true bug infection rates. However, according to a paired comparison with PCR (21), this bias might be smaller for *T. infestans* than for other triatomines. In addition, a *T. infestans* found microscopically to be infected with *T. cruzi* was also weakly positive by PCR in a blind examination performed by Dr. Jacqueline Búa of the Dr. Mario Fatala Chabén National Parasitology Institute (unpublished research). *T. guasayana* appeared implicated as a putative secondary vector of *T. cruzi* in domestic and peridomestic sites during the surveillance phase and a potential link between transmission cycles of *T. cruzi* encompassing sylvatic, peridomestic, and domestic ecotopes because of: 1) its infection with *T. cruzi,* 2) frequent invasion of domiciliary areas and attacks on humans and dogs, and 3) its significant association with young native dogs seropositive for *T. cruzi* born during the surveillance period (18). More data are needed to assess the actual infection rates of *T. guasayana*, using enhanced detection procedures and carefully designed sampling programs.

Triatoma sordida was the most abundant triatomine in peridomestic areas, where it was strongly associated with trees where chickens roosted. *T. sordida* rarely attacked humans and showed a low rate of domiciliary invasion (5). These characteristics reduce its potential contribution to *T. cruzi* transmission and may explain its low prevalence of infection. Similar results were recorded in northeastern Argentina, where *T. sordida* invaded but did not colonize domiciliary areas and was not infected with *T. cruzi* (22). In Brazil, long-term surveillance data showed very low rates of *T. sordida* domiciliary colonization, and *T. cruzi* infection rates ranging from 1%–4% (9, 23). In certain parts of Bolivia, however, the pattern may be quite different (24).

Our study was initially focused on *T. infestans*. Therefore, we did not collect baseline data to assess the impact of control actions on the prevalence of *T. cruzi* in *T. guasayana* and *T. sordida*. To our knowledge, the present data may be the first of such an extended nature for these species in Argentina.

The peridomestic environment includes key sites to eliminate triatomine infestations and *T. cruzi* transmission. Peridomestic ecotopes: 1) are more easily colonized by triatomines than domiciliary areas, 2) sustain abundant populations of different species of triatomines that invade domiciliary areas and attack humans and domestic animals, and 3) host such important reservoirs of *T. cruzi* as dogs, cats, and rodents. Triatomine control or elimination programs should include combined insecticidal sprays and environmental management measures specifically designed for peridomestic sites.

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RESUMEN

Infección por *Trypanosoma cruzi* en *Triatoma infestans* y otros triatómidos: efectos a largo plazo de un programa de control en una zona rural del noroeste de Argentina

Durante los cinco años posteriores a una fumigación masiva con deltametrina realizada en 1992 y seguida de fumigaciones selectivas, se investigó la prevalencia de la infección por *Trypanosoma cruzi* en *Triatoma infestans*, *Triatoma guasayana* y *Triatoma sordida* en Amamá y otras poblaciones rurales vecinas del noroeste de Argentina. Los triatómidos fueron recogidos en los domicilios y en el área peridoméstica por los propios residentes y por personal experto. Durante el quinquenio 1993–1997, la prevalencia de *T. cruzi* fue de 2,4% en 664 *T. infestans*, de 0,7% en 268 *T. guasayana* y de 0,2% en 832 *T. sordida*. La infección por *T. cruzi* se detectó con mayor frecuencia en las chinches adultas y en los triatómidos recogidos en los domicilios. *T. guasayana* y *T. sordida* fueron, respectivamente, ninfas y adultos recogidos en el área peridoméstica. Durante el período de vigilancia, la prevalencia de la infección por *T. cruzi* en *T. infestans* disminuyó de 7,7% en 1993 a 1,5% en 1997, aunque este cambio no fue estadísticamente significativo. La comparación de las tasas de infección de *T. infestans* antes del programa de control (1992) y durante el período de vigilancia (1993–1997) reveló una disminución altamente significativa, de 49% a 4,6%, en los dormitorios y también en las áreas peridomésticas (de 6% a 1,8%). Debido a su infección por *T. cruzi* y a su frecuente invasión de las áreas domésticas con ataques a los humanos y a los perros, *T. guasayana* parecía estar implicado como vector secundario de *T. cruzi* en las áreas domésticas y peridomésticas durante el período de vigilancia. *T. sordida* fue la especie más abundante, pero estaba estrechamente asociada a los pollos y mostró escasa tendencia a invadir los dormitorios.