RESEARCH NOTE

The Synanthropic Process of Chagas Disease Vectors in Brazil, with Special Attention to Triatoma brasiliensis Neiva, 1911 (Hemiptera, Reduviidae, Triatominae) Population, Genetical, Ecological, and Epidemiological Aspects

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Until 1983, 36% of the Brazilian territory was considered endemic, or at risk, for Chagas disease and more than 50% of all Brazilian municipalities presented domiciliary triatomine infestation. In 20 years, Chagas disease transmission decreased dramatically. The number of municipalities infested by Triatoma infestans (Klug, 1834) was reduced from 30.4% in 1983 to 7.6% in 1993 (AC Silveira & DF Rezende 1994 Rev Bras Med Trop 27: 11-22).

Ecological succession observed by the replacement of one species for another has resulted from control programs and from drastic environmental changes. Data from the Chagas Disease Control Program in Minas Gerais, for the period 1979-1989, show that Triatoma sordida (Stal, 1859) predominated the last years over T. infestans which was previously the main domiciliary vector. This fact was largely attributed to the control actions which had eliminated T. infestans from the domiciliary units (L. Diotaiuti et al. 1995 Bol Oficina Sanit Panam 118: 211-219). The same was observed for Triatoma rubrovaria (Blanchard, 1843) and T. infestans in Rio Grande do Sul for the period 1980-1998 (Fundação Nacional de Saúde).

Triatomine species were clustered in categories according to their vectorial potentiality, with consequences applied to objectives and strategies of control programs. It was reported that T. rubrovaria and Rhodnius neglectus Lent, 1954, both found naturally infected by Trypanosoma cruzi, occupied empty niches following the elimination of T. infestans, in Rio Grande do Sul and some areas of Goiás, respectively. Rhodnius nasutus Stal, 1859 presents a focal importance in the transmission of disease in Ceará and particularly in Rio Grande do Norte, in spite of a low rate of T. cruzi natural infection. Triatoma vitticeps (Stal, 1859) has a geographical distribution restricted to Rio de Janeiro, Espírito Santo and Minas Gerais. Nevertheless, this species presents one of the highest rates of natural infection and is able to invade domiciles. Panstrongylus megistus (Burmeister, 1835) and Triatoma brasiliensis Neiva, 1911, classified as “native” species, cannot be eradicated by a continuing and regular chemical control because treated houses may be reinfested from wild foci. T. infestans and Triatoma rubrofasciata (De Geer, 1773) which are considered as “introduced” species and strictly domiciliated in Brazil, can be eliminated without the possibility of reinfestation from extradomiciliary foci. However, T. infestans and T. rubrofasciata have distinct epidemiological importance. T. infestans presents a marked anthropophily and was considered the most important Chagas disease vector while T. rubrofasciata prefers domestic rodent as blood source (Silveira & Rezende 1994 loc. cit.).

Recently, P. megistus was found in artificial ecotopes in Florianópolis, Santa Catarina, southern Brazil. T. cruzi infection rate of the analyzed specimens was 53.3% and a similar rate was obtained from wild specimens. Precipitin tests revealed that 94% of the insects fed on only one blood source. The gut content of 80.6% adult insects reacted for human blood. It must be stressed that this species was reported in domiciliated condition only in northeastern and southeastern Brazil (M Steindel et al. 1994 Rev. Inst Med trop S Paulo 36: 43-50).

It is also important to mention the existence of species formerly considered as strictly wild but which have been having more and more contact with human hosts, changing therefore their epidemiological characteristics. Rhodnius brethesi Matta, 1919, for instance, which occurs among the piassaba palm trees (Leopoldinia piassaba Walace) and feed on wild animals that live in these ecotopes,
The Amazon region, which corresponds to more than 40% of the Brazilian territory, presents one of the highest biodiversity in the planet. More than 500,000 km² of Amazon forest was devastated, becoming one of the priorities of the Brazilian Ministry of Health. The domiciliation of wild vectors of Chagas disease, human habits and migration are among the most important epidemiological features concerning the health authorities. The vector potentiality of species until now considered as secondary, or out of importance, to Chagas disease transmission, has to be evaluated. It is important to consider the fact that the process of domiciliation for a given species not only facilitates its survival but also its dispersion (OP Forattini 1980 Rev Saúde Pública 14: 265-299). Reports of wild species invading houses, make it difficult, in certain cases, to distinguish if this fact represents a simple invasion event or the beginning of a domiciliation process.

Besides the environmental changes, it is also known that modifications of bioclimatic factors may directly affect triatomines biology and distribution: higher temperatures may affect the geographical expansion in latitude and altitude of triatomin species. Domiciliated species are expected to exhibit shorter life cycle and higher population growth (SI Curto de Casas et al. 1994 Entomologia & Vectores 1: 51-64).


The genetic-ecological characteristics of T. brasiliensis lead this species to occupy natural as artificial ecotopes. It takes place therefore actively in the T. cruzi wild cycle, being able to transport the parasite from wild foci to artificial ecotopes, allowing the infestation and reinfestation of human dwellings. Multidisciplinary studies showed that T. brasiliensis is constituted by, at least, four geographical populations: brasiliensis, melanica, macromelasoma and juazeiro. These populations can be differentiated by their morphology (J Costa et al. 1997 Mem Inst Oswaldo Cruz 92: 463-498), biology (J Costa & V Marchon-Silva 1998 Entomologia & Vectores 5: 23-34), isoenzymes (J Costa et al. 1997 Mem Inst Oswaldo Cruz 92: 459-464) and ecology (J Costa et al. 1998 Mem Inst Oswaldo Cruz 93: 7-13). Crossing experiments carried out among these four populations of T. brasiliensis demonstrated evidence of genetic incompatibility in F2 and F3 only when brasiliensis was crossed with melanica population. This may indicate that these two populations can be in the beginning of a process of reproductive isolation (J Costa et al. unpublished data).

Under the epidemiological point of view, it was observed that “brasiliensis” population is the most important, because of its widespread distribution (Maranhão, Piauí, Ceará, Rio Grande do Norte and Paraíba), highest natural infection level (15%) and ability to occupy a great variety of ecotopes (domestic and wild ones). The “macromelasoma and juazeiro” populations were reported only from Pernambuco and Bahia, respectively, occupying peridomiciliar and wild ecotopes. Nevertheless, no T. cruzi natural infection was found in specimens from these two populations. The “melanica” population, from the north of Minas Gerais, was only collected in natural ecotopes. It presented 6% of natural infection, and was considered as important in the maintenance of the wild cycle of T. cruzi. The strains of T. cruzi obtained from these T. brasiliensis populations were characterized phenotypically and genotypically (J Costa et al. 1996 Rev Bras Med Trop 29: 128-129 ) and their clustering in its respective zymodemes are in progress.

Since the description of Chagas disease, many changes in its epidemiology have been observed. Actually, drastic and deep environmental changes allow artificial ecotopes to be occupied by triatomines. The domiciliation of wild vectors of Chagas disease, human habits and migration are among the most important epidemiological features concerning the health authorities. The vector potentiality of species until now considered as secondary, or out of importance, to Chagas disease transmission, has to be evaluated. It is important to consider the fact that the process of domiciliation for a given species not only facilitates its survival but also its dispersion (OP Forattini 1980 Rev Saúde Pública 14: 265-299). Reports of wild species invading houses, make it difficult, in certain cases, to distinguish if this fact represents a simple invasion event or the beginning of a domiciliation process.

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tated in the last ten years (4.15% of the total area, http://www.ibge.gov.br). In this region, Chagas disease was always considered as a wild enzooty, and until now, at least 18 triatomine species have already been reported in this region, nine of them infected by *T. cruzi* or *T. cruzi* “like” (Coura et al. *loc. cit.*). The lack of data on probable new habitats for triatomines, the possible existence of new species and even the lack of detailed studies for the already recorded species, impair the estimation for Chagas disease spreading on Amazon region. Moreover, human migration from northeastern endemic areas of Brazil increases the risk of future endemics. The continuing vigilance, effective research and health education of the inhabitants focused to the importance to notifying the presence of triatomines inside the houses as performed in other endemic regions, are fundamental actions to understand, monitor and control Chagas disease transmission in these new environments.

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