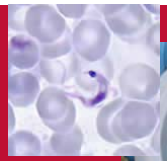


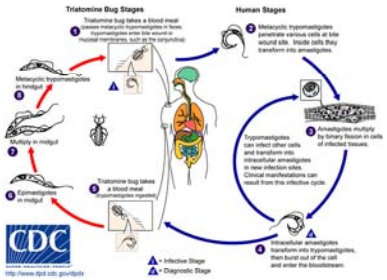
Chagas Disease in Ecuador

Patricia Carr

Ohio University Tropical Disease Institute and Pontificia Universidad Católica del Ecuador

Centro de Investigación en Enfermedades Infecciosas

Chagas Disease



There are currently 8 to 11 million people living with Chagas disease in Latin America (CDC, *Chagas Disease, 2009*), and "670,000 premature disabilities and deaths per year worldwide" (de Meis, J., Morrot, A., Farias-de Oliveira, D. A., Villa-Verde, D. M. S., Savino, W., 2009); yet many of those infected have never heard of the disease. Chagas disease is caused by an infection with the protozoan parasite, *Trypanosoma cruzi*, which infects humans through the bite of triatomines, also known as "kissing bugs, benchuca, cinchuca, chinche[,] barbeiro", or chinchorros (CDC, *Provider Fact Sheet,* n.d.). The insects commonly live in mud walls or thatched roofs in impoverished regions of Latin America. The parasite replicates in the triatomine gut and is then excreted in the feces after the bug takes a blood meal (CDC, *Parasites and Health,* 2009). The trypomastigotes enter the person's body when they scratch the bite or rub their eyes after touching the bite site (CDC, *Chagas Disease, 2009*).

Chagas disease has both an acute and chronic phase. During the acute phase which lasts 4-8 weeks after initial infection, blood parasite load is high and circulating parasites infect distant sites (de Meis, 2009). The acute infection phase can be asymptomatic or patients can experience mild, nondescript symptoms (CDC, *Chagas Disease, 2009*).

After the first few months, parasitemia will spontaneously resolve and patients will enter the chronic phase of the infection, which in about 70% of patients is asymptomatic for life; however, about 30% of patients develop severe gastrointestinal or cardiac complications decades later (Bern, *et. al.,* 2007).

Diagnosis and Treatment

Diagnosis of Chagas disease is easiest during the acute phase through hemoculture or xenodiagnosis, (Reithinger, *et al.*, 2010). However, once a patient enters the chronic phase, blood parasite levels are unlikely to be high enough for these techniques to be effective means of diagnosis so serological and molecular tests must be used (Reithinger, 2010). Serological tests, which include Enzyme-linked immunosorbent assay (ELISA), indirect hemagglutinantion assay (IHA), immunofluorescent antibody test (IFA), and radioimmune precipitation assay (RIPA), have high sensitivities but their specificities range from 60-100% so the World Health Organization recommends performing multiple tests in order to confirm a positive diagnosis (CDC, *Chagas Disease,* 2009; Reithinger, 2010; Verani, 2009). In addition, molecular tests, such as PCR-based methods are available and have high specificities but low sensitivities (Reithinger, 2010).

Rapid tests have recently become available and our research team employed two on each patient, those being: Stat-Pak (Chembio Diagnostic Systems, Medford, NY); and Trypanosoma Detect (Inbios International, Seattle, WA).

Stat-Pak test

Trypanosoma Detect test

Project Goals

The problem that we were addressing with this research is that the epidemiology of Chagas disease and that of its transmission is not well understood in Ecuador; yet, it is estimated that 120,000 to 200,000 Ecuadorians are infected, often unknowingly, with the *T. cruzi* parasite and up to 25% of the Ecuadorian population is at risk of being infected (Black, Carla L., *et al.*, 2007). In addition to the prevalence and housing survey data, we were also gathering samples in order to compare the results of the rapid screening tests to more reliable serological techniques to determine the sensitivity and the specificity of the rapid tests in Ecuador. This is of utmost importance as there is speculation about the effectiveness of these tests in identifying the particular strain of *T. cruzi* that is present in Ecuador.

Field Research

The survey component consisted of housing survey teams which went door to door in selected communities searching homes for triatomines, the insect vector of Chagas disease, fumigating homes where there were infestations, and educating the home owners and their families on the dangers of Chagas disease and how to protect themselves from infection. As part of the entomologic searches we also collected any triatomines that were found so that they could be tested for *T. cruzi* parasites in the laboratory in Quito, and recorded the species, stage of development, and location where each insect was found for future analysis. We also interviewed the home owners about the materials they had used to construct their houses, their animal husbandry practices, whether their homes had been fumigated, how recently, and by whom, and other general questions to gauge their living situation such as whether they had a toilet at home and how many people live in the home. Later this information will be used to help identify risk factors for the presence of domiciliary and peridomiciliary triatomines.

The Healthy Housing component focused on the social, cultural, and economic contributors to triatomine infestation and subsequent Chagas infections. This component is in the preliminary phase of development but hopefully it will be the future of the project as the goal is to work with communities to repair and rebuild homes in such a manner that triatomines will not be able to enter and infest the homes.

In the Clinical component we set up screening and primary care clinics at the community schools to test community members for Chagas disease. If an individual was found to be infected with Chagas they were then referred to the Ministry of Health so they could receive free treatment.

In the hospital component students tested patients in the cardiac ward to gather data on cardiac morbidity due specifically to Chagas disease in the region's capital hospital. They also tested women in the maternity ward for Chagas to get some baseline data that will be used to launch a congenital Chagas disease project in the near future.

Results

The entomology component had data available at the end of the field work, since some of their data could be interpreted without laboratory processing. The leader of this component, Dr. Anita G. Villacís compiled and presented some general statistics on the entomologic searches completed during the field research. In 13 communities in the Loja province of Ecuador, we searched 354 homes, 48 of which had triatomines, and 42 of those with triatomines had nymphs suggesting active reproduction in or around these homes (Center for Infectious Disease Research, 2010). The infestation index, which is calculated as the number of infested houses divided by the number of houses searched, ranged from 0-32.1% across the 13 communities, with an overall infestation index of 13.56%. The percent of community homes examined ranged from 50- 100% with only 65.31% of the total number of houses in all 13 communities being examined.

There was still a great deal of laboratory processing that needed to be done in Quito after the completion of the field work, even before the majority of the data analysis could be started. For example, the entomology component collected a total of 1678 triatomines, which were all taken back to the lab in Quito to be tested for the presence of *T. cruzi* in their guts (Center for Infectious Disease Research, 2010). In addition, the students in the laboratory component also cultured the venous blood samples to look for the presence of *T. cruzi* parasites circulating in the blood stream of individuals tested in the clinics and the hospital components and using serological tests to search for *T. cruzi* antibodies they will confirm or refute the results of the rapid tests performed in the field.

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