Smithsonian Tropical Research Institute

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Chagas Disease Surveillance Focuses on Palms, Undercover Bugs

The first systematic study of surveillance techniques for the insect vector of Chagas disease in Amazonia, conducted by researchers from the Fiocruz Instituto Leônidas e Maria Deane, the Smithsonian Tropical Research Institute, the London School of Hygiene and Tropical Medicine and colleagues, concludes that tall palm trees with large amounts of debris on their crowns and stems should be targets for disease surveillance and control.

Chagas disease, caused by a parasite transmitted by blood-sucking bugs, results in severe heart, digestive and neurological lesions. Chagas disease is chronic in Latin America where *Trypanosoma cruzi* infects about 7.5 million people. "The burden of Chagas disease in the Latin American-Caribbean region is still consistently larger than the *combined* burden of malaria, leprosy, the leishmaniases, lymphatic filariasis, onchocerciasis, schistosomiasis, viral hepatitides B and C, dengue, and the major intestinal nematode infections," write the authors of the study, published Mar. 2, 2010 in the open-access journal, PLoS Neglected Tropical Diseases.

The insect vectors of Chagas disease, triatomine bugs, usually infest low quality housing in rural and peri-urban areas. While increasing the chances of transmission to residents, their domestic habits make control easier to achieve. Huge insecticide-spraying campaigns have halted *T. cruzi* transmission in vast areas of South and Central America.

However, in Amazonia, where there are at least 100,000 infected people, insecticide-based control is not feasible because the insects seldom breed within houses. Most transmission occurs when triatomine bugs emerge from their natural habitats--usually palm trees--and fly into houses, attack rural workers or contaminate food or food-processing equipment.

Ascertaining whether a palm tree is infested is problematic. The small, cryptically-colored bugs easily go undetected. The authors asked whether all palms are equally likely to harbor triatomine bug colonies – while explicitly acknowledging that no detection technique works perfectly. Then, they determined whether palm infestation rates were associated with environmental differences at the regional, landscape, or individual palm tree level. Their study also asked whether palm tree management could lower palm infestation rates.

Building upon analytical methods recently developed by wildlife biologists, the study emphasizes that a disease vector is not necessarily absent from a site where it was not detected during a survey. Such 'detection failures' are pervasive – a feature that is inherent to all vector studies. The robust methodology described in this paper is generally suited for investigating vector occurrence and ecology when detection is imperfect.

Based upon this study, vector surveillance teams can now draw upon clearly defined detection criteria. Surveillance teams should consider the circumstances at the origin of a disease outbreak or an isolated acute case. A 'high-risk' palm tree will very likely be found near the residence of the patients or near an unprotected fruit press used to prepare contaminated juice. These recommendations are consistent across different Amazon sub-regions and landscapes. Finally, the study suggests that simple environmental management practices, such as removing organic debris from the crowns and stems of peri-domestic palms, may substantially reduce the risk of vector-human contact.

The Smithsonian Tropical Research Institute, headquartered in Panama City, Panama is a unit of the Smithsonian Institution. The institute furthers the understanding of tropical nature and its importance to human welfare, trains students to conduct research in the tropics and promotes conservation by increasing public awareness of beauty and importance of tropical ecosystems. www.stri.org

Reference: Fernando Abad-Franch, Gonçalo Ferraz, Ciro Campos, Francisco S. Palomeque, Mario J. Grijalva, H. Marcelo Aguilar, Michael A. Miles. 2010. Modeling disease vector occurance when detection is imperfect: infestation of Amazonian palm trees by triatomine bugs at three spatial scales. PLoS Neglected Tropical Diseases. http://dx.plos.org/10.1371/journal.pntd.0000620

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Photos and caption information:

Attalea butyracea

The authors sampled 298 *Attalea* palms across four regions from Napo, near the Ecuadorean Andes, to three regions in the Brazilian Amazon.

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Adhesive trap for triatomine bugs

Researchers sampled 255 individual palm trees for triatomine bugs, employing a combination of adhesive traps (shown here) and manual bug searches.

Credit: This image may be freely reused so long as the authors and original work are cited: Abad-Franch et al., PLoS Negl Trop Dis 4(3).