

Free-roaming Kissing Bugs, Vectors of Chagas Disease, Feed Often on Humans in the Southwest

Stephen A. Klotz, MD,^a Justin O. Schmidt, PhD,^b Patricia L. Dorn, PhD,^c Craig Ivanyi, MS,^d Katherine R. Sullivan, BS,^e Lori Stevens, PhD^e

^aDivision of Infectious Diseases, Department of Medicine, University of Arizona, Tucson; ^bSouthwestern Biological Institute, Tucson, Ariz; ^cDepartment of Biological Sciences, Loyola University, New Orleans, La; ^dArizona-Sonora Desert Museum, Tucson; ^eDepartment of Biology, University of Vermont, Burlington.

ABSTRACT

BACKGROUND: Kissing bugs, vectors of *Trypanosoma cruzi*, the parasite that causes Chagas disease, are common in the desert Southwest. After a dispersal flight in summer, adult kissing bugs occasionally gain access to houses where they remain feeding on humans and pets. How often wild, free-roaming kissing bugs feed on humans outside their homes has not been studied. This is important because contact of kissing bugs with humans is one means of gauging the risk for acquisition of Chagas disease.

METHODS: We captured kissing bugs in a zoological park near Tucson, Arizona, where many potential vertebrate hosts are on display, as well as being visited by more than 300,000 humans annually. Cloacal contents of the bugs were investigated for sources of blood meals and infection with *T. cruzi*.

RESULTS: Eight of 134 captured bugs were randomly selected and investigated. All 8 (100%) had human blood in their cloacae, and 7 of 8 (88%) had fed on various vertebrates on display or feral in the park. Three bugs (38%) were infected with *T. cruzi*. Three specimens of the largest species of kissing bug in the United States (*Triatoma recurva*) were captured in a cave and walking on a road; 2 of 3 (67%) had fed on humans. No *T. recurva* harbored *T. cruzi*.

CONCLUSIONS: This study establishes that free-roaming kissing bugs, given the opportunity, frequently feed on humans outside the confines of their homes in the desert Southwest and that some harbored *T. cruzi*. This could represent a hitherto unrecognized potential for transmission of Chagas disease in the United States.

© 2014 Elsevier Inc. All rights reserved. • *The American Journal of Medicine* (2014) 127, 421-426

KEYWORDS: Chagas disease; Kissing bugs; Triatominae; *Trypanosoma cruzi*

SEE RELATED EDITORIAL p. 361

Eleven species of hematophagous kissing bugs are found in the United States, and all potentially harbor *Trypanosoma cruzi*, the parasite that causes Chagas disease. Kissing bug home ranges extend northward into the bottom two thirds of

the United States; however, the nearest endemic area of Chagas disease in humans is in Mexico.¹ Yet, with climate change and possible changes in the behavior of kissing bugs, there is a potential for an increase in the number of vector-transmitted human infections with *T. cruzi* in the United States.²

Adult kissing bugs in the Southwest undergo a dispersal flight before the monsoon rains during the hottest days of summer and are attracted to lights near and on houses,³ which they may enter beneath door thresholds and through window casings and feed on pet and human inhabitants (Figure 1). This occasionally leads to human anaphylaxis⁴ or, rarely, infection, in the United States. Kissing bugs are nuisances in homes in San Diego, California, and Phoenix and Tucson, Arizona.⁴

Funding: This work was funded in part by the National Institutes of Health Grant 1R15 A1079672-01A1 and the National Science Foundation Grant BCS-1216193 as part of the joint National Science Foundation, National Institutes of Health, US Department of Agriculture Ecology and Evolution of Infectious Diseases program awarded to LS.

Conflict of Interest: None.

Authorship: All authors had access to the data and played a role in writing this manuscript.

Requests for reprints should be addressed to Stephen A. Klotz, MD, 1501 N. Campbell Ave, Tucson, AZ 85724.

E-mail address: sklotz@u.arizona.edu

Chagas disease in Latin America is closely linked to house construction with thatch roofing and wattle and daub walls that provide numerous crevices for bugs to hide. Kissing bugs colonize these homes and peridomestic structures and may achieve densities of more than 1000 bugs per home. In this setting, contact with humans occurs frequently and often leads to infection. In contrast, home construction in the warmer parts of the United States where kissing bugs reside is different, with an emphasis on energy conservation and sealing of homes for air conditioning. Furthermore, use of solid wall and roof construction, features not conducive to colonization by kissing bugs, is standard in construction. Nevertheless, there are 7 well-documented autochthonous cases of Chagas disease in the United States.⁵ Five of the seven cases involved infants or young children who presumably were infected in the home or the immediate environs. There may be more autochthonous cases.⁶ A well-documented example of autochthonous Chagas disease is a 74-year-old woman in New Orleans Parish, Louisiana, who was acutely infected with Chagas (*T. cruzi* was cultured from her blood). More than 20 adult kissing bugs were found in her home; 56% harbored *T. cruzi*. Neither nymphs nor eggs were found in the house, indicating that the home was not colonized. However, the house was 29 years old and provided many gaps for entry of bugs.⁷

Contact between kissing bugs and humans is an important indicator of the potential risk for Chagas disease and can be determined by investigating the frequency of human blood feeding. As mentioned, kissing bugs feed on humans when trapped in houses after a dispersal flight, but little is known about the feeding habits of wild, free-roaming bugs. Is it possible that kissing bugs, like mosquitoes, feed on people engaged in outside activities? To answer this question, we determined the blood meal sources of wild kissing bugs captured in a zoological park in close proximity to a variety of vertebrates. Our findings indicate that wild-caught bugs feed often on humans in addition to large and small vertebrates.

MATERIALS AND METHODS

Ultraviolet "black lights" were set up in the desert in areas providing a clear flight path for the insects from all directions to the light source. A total of 134 kissing bugs (121 *Triatoma rubida* and 13 *Triatoma protracta*) were collected using ultraviolet lights at the Arizona-Sonora Desert Museum (ASDM), Tucson, Arizona, in May and

June 2009. In addition, 2 wild adult *Triatoma recurva* were collected on a roadway in Bisbee, Arizona, and 1 was collected in Colossal Cave, Arizona. These are the 3 most common kissing bugs in southern Arizona. Bugs were placed in individual vials with 95% ethanol + 5% glycerol. Of the 134 insects captured at the ASDM, 8 were randomly chosen to include both sexes, species, and collection sites. Blood sources⁸ and *T. cruzi* parasite infection⁷ using primers from Moser et al⁹ were determined for each insect as previously reported.¹⁰ By using universal vertebrate primers for the mitochondrial *12S* ribosomal gene,^{11,12} a broad net was cast to potentially identify as many blood meals as possible. Previous work established that assays based on the *12S* gene detected more blood meal sources than an assay based on the mitochondrial cytochrome B gene.¹⁰ The polymerase chain reaction products were cloned and sequenced to isolate multiple blood meals within a single insect.

Blood meal sources were inferred by using BLAST (<http://blast.ncbi.nlm.nih.gov/Blast.cgi>). Seventy-one clones from 11 bugs containing vertebrate blood were isolated and characterized. All had more than 98%, 99%, or 100% matches with the BLAST searches.

RESULTS

Eight of 8 (100%) of the kissing bugs randomly selected from among 134 bugs captured at the ASDM showed evidence of having fed on humans (Figure 2), as did 2 of 3 *T. recurva*, 1 from Bisbee, Arizona, and 1 from Colossal Cave, Arizona. The vertebrate taxa for the blood meals for kissing bugs captured in the museum in addition to animals on display or feral in the museum are shown in Table 1. On average, there were 2.9 ± 1.1 different blood sources per bug. The museum exhibits 106 living mammals of 31 taxa, 241 birds of 72 taxa, and 361 reptiles of 86 taxa that are potential blood meal sources for kissing bugs. In addition to these animals in captivity, an unknown number of native fauna live free on the grounds. Pigs (*Sus scrofu*) appear to be a favorite food source for kissing bugs, with 6 of 8 bugs having fed on pigs. However, there are no known domestic or feral pigs within 1 mile of the museum; thus, we infer that there are unknown feral pigs in areas immediately surrounding the park or bugs are flying into the park after having fed on pigs. There are numerous javelinas (collared peccaries) on display and feral in the park, but the DNA match was closest to pig, not javelina. Other captive hosts also served as blood meal sources, including wolf or coyote (these 2 species of animals are

CLINICAL SIGNIFICANCE

- Free-roaming kissing bugs, vectors of Chagas disease, take blood meals from many different mammals in the wild.
- Free-roaming kissing bugs also feed on humans (when outside their homes), if given the opportunity.
- Because contact of kissing bugs with humans is one measure of the risk for Chagas disease, this feeding on humans (when outside their homes) may be an unrecognized risk factor for vector-transmitted Chagas disease in the United States.

Download English Version:

<https://daneshyari.com/en/article/5878387>

Download Persian Version:

<https://daneshyari.com/article/5878387>

[Daneshyari.com](https://daneshyari.com)