



## ***Blood Feeding Insect Series: American Trypanosomiasis*** **- Chagas Disease<sup>1</sup>**

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### **What is Chagas Disease?**

American trypanosomiasis, also known as Chagas disease, is a potentially fatal, chronic disease that currently affects twelve million people throughout Mexico, Central and South America. The disease is caused by a protozoan parasite, *Trypanosoma cruzi*. *T. cruzi* is transmitted to humans and animals by triatomine bugs, commonly referred to as "kissing bugs" (Fig. 1). Additionally, humans can contract the disease from blood transfusions with contaminated blood.

Chagas disease can cause different symptoms depending on the location of the parasite in muscle tissue. Acute infections can be fatal, but most humans survive acute infection. Acute symptoms include:

- Romañas sign: an obvious swelling of the eye and surrounding area
- Fever
- Skin rash

- Enlarged lymph nodes, liver, or spleen

Acute infections are treatable using medications prescribed by a physician.

Symptoms of chronic cardiac infection in humans include:

- Heart palpitations
- Dizziness
- Chest pain
- Fainting

Chronic Chagas infection of the cardiac muscle will eventually result in cardiac failure and death of the host. There are no cures for chronic Chagas infection. Heart transplants can delay death, but the protozoans will still remain in other muscle tissue and can re-infect cardiac muscle. Other deleterious effects of Chagas disease include mega-colon, mega-esophagus and encephalitis in small children.

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**Figure 1.** Top: Female *Triatoma gerstaeckeri*. Bottom: Male *Triatoma sanguisuga*. Credits: S. A. Kjos, Texas A & M University

### Life Cycle of Triatomine Bugs

There are 105 known species of triatomine bugs in the Western hemisphere. Each species has unique biological characteristics that affect their ability to transmit the parasite. The average life expectancy from egg to adult can range from three months to two years, depending on the species. Triatomine bugs are hemimetabolous, which means the young look similar to the adults. The immature bug will molt five times before it becomes a reproductive adult. The juveniles feed at least once during each molting stage, and the adults will feed multiple times. Triatomine males and females both feed on blood. Feeding on humans occurs at night when the host is asleep.

### Transmission Cycle of Chagas Disease

Often times, Latin American triatomines will feed near the eyes and lips, earning them the common name “kissing bugs”. Feeding near the eyes and lips greatly increases the risk of transmission of *T. cruzi*. Unlike many arthropod-borne diseases, *T. cruzi* is not transmitted to humans directly by the bite of the infected insect. Triatomine bugs defecate while blood-feeding. If the insect is infected with the parasite, it can enter the bloodstream when the host scratches the irritated bite wound.

The parasite then replicates within the bloodstream of the host - this is known as the acute phase. It takes one to two weeks after introduction of the parasite for the acute phase to be manifested. During the acute phase, the parasite is readily found

in the blood stream and can be transmitted to uninfected triatomine bugs that feed on the host.

After two to six weeks, the acute phase ends and the chronic phase begins. During the chronic phase, the protozoans will replicate in the smooth muscle tissue and are rarely found circulating in the bloodstream. After a triatomine bug has fed on an infected host, the parasite will begin to multiply in the insect midgut and remain until it is expelled in the feces during the next blood meal.

### Wild and Domestic Animals as Reservoirs

Reservoirs for the parasite that causes Chagas disease are armadillos, badgers, coyotes, opossums, raccoons, skunks, wood rats, and many rodent species. Opossums are particularly important in South America because the parasite can complete its life cycle in the anal glands of this marsupial.

Domesticated animals such as cattle, sheep, dogs and cats are potential reservoirs as well. Animals can easily become infected with *T. cruzi* when an infected triatomine bug is ingested. Dogs and cats play an important role as reservoirs in many South American transmission cycles.

Clinical symptoms of *T. cruzi* infection in dogs are difficult or labored breathing. Dogs can contract Chagas disease in either urban or rural settings. Chronic, cardiac infections of the parasite can be fatal to dogs. While little can be done for chronic infections, acute infections can potentially be treated with medication by a veterinarian.

### Is there a risk of contracting Chagas Disease for Florida citizens?

Chagas Disease is one of the rare vector-borne diseases which is succumbing to control efforts in the Americas. Improved housing and the application of residual insecticides to control triatomine bugs are important for reducing the number of people infected with the parasite.

In the southeastern United States, infected triatomine bugs and reservoir hosts have been found from Texas to Florida and as far north as Oklahoma and Maryland. However, there is minimal chance of transmission to humans.

The high disease prevalence throughout Latin America is due primarily to human dwellings being suitable habitats for triatomines. Earthen floors, thatched roofs and mortared brick walls are all inviting habitats for large populations of domesticated triatomines. These living conditions are not prevalent in the United States and thus human/vector contact drastically decreases.

There are many species of triatomine vectors in the southeastern United States, but only *Triatoma sanguisuga* and *Triatoma gerstaeckeri* are of major concern due to their high abundance. *Triatoma sanguisuga* is found in Florida, while *Triatoma gerstaeckeri* is not. Feeding habits of *T. sanguisuga* and *T. gerstaeckeri* differ from their Latin American counterparts. *T. sanguisuga* and *T. gerstaeckeri* are very cautious and neither will walk completely onto a host, reducing the chances of defecating on the host. Both *T. gerstaeckeri* and *T. sanguisuga* generally do not defecate while feeding, reducing fecal contact with the wound even further.

### Infection from the blood supply?

The main threat of contracting Chagas Disease to Florida residents is from blood transfusions with contaminated blood. More than one million native Latin Americans live in the United States and they are estimated to have infection rates as high as 10%. A vast majority of people infected with the parasite will not develop clinical symptoms for ten to twenty years. This means that blood donors may unknowingly donate Chagas infected blood.

Currently there is no F. D. A.-certified test for detecting the parasite in donated human blood, although there are several pending approval. Blood can be safely decontaminated using Gentian Violet. To limit the threat of infection through blood transfusions, blood bank workers in central Florida ask detailed questions during the blood donor screening process concerning travel history and whether donors have been diagnosed with Chagas Disease. If the donor has traveled to any countries where Chagas Disease is endemic (Fig. 2), they will be disqualified from donating blood. Chagas Disease will not likely be a problem for most Florida residents with no travel history to Central or South America.



**Figure 2.** Geographical Distribution of Chagas Disease  
Credits: World Health Organization

## Control of Triatomine Bugs

The probability of human or pet infection in the southeastern U.S. is very low. Unless there is evidence of *T. cruzi* transmission and pathology, insect control is not necessary. If it becomes necessary to implement control measures, the following information can be useful.

Triatomines found in the southeastern United States typically live in close association with burrowing animals. Any burrowing animal, especially wood rats, located within thirty meters of human dwellings should be removed and its nest destroyed. This is very important if kissing bugs are observed inside of human or domestic animal dwellings and if there is evidence of transmission of the parasite. If these animals are found on your property - armadillos, badgers, coyotes, opossums, raccoons, skunks, wood rats or other rodent species, along with triatomine vectors in the home - removal of the animals should be considered.

To reduce possible infection to dogs, homeowners may want to remove all burrowing animals from their property if possible. Dogs, by nature, are very curious and will seek out burrowing rodents, thereby coming into contact with vectors more frequently.

Lights attract triatomines at night. Any entrances or openings to the home close to the lights should be closed and sealed. If at all possible move lights away from doors. Cracks within the home should be sealed since these are the most likely areas that triatomines will reside. Make a thorough inspection of animal cages and resting areas as well. When making inspections, look for triatomine bugs as well as dark speckles that could indicate triatomine fecal

droppings. Pesticides should be applied according to the label to any areas where triatomines are seen. Contact local extension agents for more information regarding what types of pesticides are safe and effective for use in the home.

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