



Chagas Disease

Disease Plan

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Last updated: December 5, 2019, by Dallin Peterson.

Questions about this disease plan?

Contact the Utah Department of Health Bureau of Epidemiology: 801-538-6191

✓ **CRITICAL CLINICIAN INFORMATION**

Clinical Evidence
<p>Signs/Symptoms</p> <ul style="list-style-type: none">• Acute phase (first 8 weeks)<ul style="list-style-type: none">○ Fever○ Malaise○ Rash○ Body aches○ Chagoma (nodular swelling at site where parasite entered body)○ Romana's sign (swelling of the eyelid near bite wound)• Chronic phase (after 8 weeks)<ul style="list-style-type: none">○ Cardiac complications○ Gastrointestinal complications
<p>Period of Communicability</p> <ul style="list-style-type: none">• Chagas is not spread person-to-person, but can be transmitted congenitally and through blood transfusion, organ transplantation, and blood products. Parasitemia is highest during acute infection, but the organism may persist in very small numbers indefinitely. Insect vectors become infective 10–30 days after biting an infected animal; gut infection in the bug persists for life (up to two years).
<p>Incubation Period</p> <ul style="list-style-type: none">• Range from 1–5 weeks, average 3 weeks
<p>Mode of Transmission</p> <ul style="list-style-type: none">• Exposure to fecal matter of triatomine bug (kissing bug)• Congenital transmission• Contaminated blood products or organ transplantation• Ingestion of contaminated food or drink
Laboratory Testing
<p>Type of Lab Test/Timing of Specimen Collection</p> <ul style="list-style-type: none">• Acute infection (within 8 weeks): Isolation by microscopy, culture, polymerase chain reaction (PCR)<ul style="list-style-type: none">○ PCR testing can only be performed by the Centers for Disease Control and Prevention (CDC) upon request.• Chronic Infection (after 8 weeks): Antibody specific assay<ul style="list-style-type: none">○ Parasitic smears by microscopy can be performed at some commercial laboratories.○ Serologic assays are commercially available.<ul style="list-style-type: none">▪ Specific serologic assays can also be performed by CDC upon request.
<p>Type of Specimens</p> <ul style="list-style-type: none">• Serology – serum (red top tube or serum separator) at least 4 mL at 4°C• PCR – whole blood (purple, yellow or blue top tube) at least 4 mL, at 4°C• Immunohistochemistry – formalin fixed or paraffin-embedded tissues at room temperature
Vector Identification and Testing
<p>In cases where triatomine bites are recognized, it is requested the bugs be identified by an entomologist. Contact the Utah Department of Health (UDOH) at 801-538-6191 for resources. Kissing bugs that have potentially exposed humans may be sent to CDC for <i>T. cruzi</i> testing. Bugs that are not known to have exposed humans can be sent to other commercial or university laboratories. If a bug is positively identified and found to be infected with <i>T. cruzi</i>, human testing should be performed on the exposed person by PCR.</p>

Treatment Recommendations
Type of Treatment <ul style="list-style-type: none">• Antiparasitic treatment is recommended for people early in the course of infection (acute phase), congenital infection, and for those who are immunocompromised.• Treatment can also benefit adults with chronic <i>T. cruzi</i> infection in the absence of advanced Chagas cardiomyopathy.• FDA approved treatment is Benznidazole. See Treatment section for more details.
Prophylaxis <ul style="list-style-type: none">• None
Contact Management
Isolation of Case <ul style="list-style-type: none">• None
Quarantine of Contacts <ul style="list-style-type: none">• None
Infection Control Procedures
<ul style="list-style-type: none">• None

✓ WHY IS CHAGAS DISEASE IMPORTANT TO PUBLIC HEALTH?

Chagas disease is caused by the parasite *Trypanosoma cruzi* (*T. cruzi*) which is transmitted through the fecal droppings of infected insect vectors from the triatomine family, also known as kissing bugs. Human disease is most common in South America, Central America, and Mexico. In most cases, transmission occurs when feces from an infected vector contaminate conjunctivae, mucous membranes, abrasions, or insect bite wounds. Most cases are asymptomatic, but in up to 20–30% of infections, chronic manifestations, including heart and gastrointestinal tract problems can appear years after infection. An estimated 5–7 million people in Latin America have the disease.

✓ DISEASE AND EPIDEMIOLOGY

Clinical Description

Acute Phase

The acute phase begins 1–2 weeks after infection and usually lasts up to eight weeks. Most persons in the acute phase have nonspecific symptoms including malaise, fever, rash, body aches, loss of appetite, vomiting, and diarrhea. However, most cases are asymptomatic. Young children are more likely to exhibit symptoms than adults. Unilateral edema of the eyelids, known as Romana's sign, may occur if the portal of entry is the conjunctivae or area around the eye. Symptoms usually disappear within a few weeks or months without treatment. However, in some cases severe acute disease may manifest as myocarditis, pericardial effusion, or meningoencephalitis.

Chronic Phase

After levels of the parasite in the bloodstream fall below detectable levels, the untreated patient enters the chronic phase. If treated in the acute phase, a patient will not advance to the chronic phase. Patients may not have signs or symptoms, but an estimated 20–30% of patients develop cardiac or gastrointestinal forms of the disease. Cardiac complications of chronic infection include arrhythmias, palpitations, aneurysm, heart failure, and stroke. Gastrointestinal symptoms are less common and include megacolon and megaesophagus. Patients with the gastrointestinal form of the disease may have difficulty swallowing that can result in severe weight loss.

Congenital Chagas Disease

Most infants with congenital Chagas disease are born asymptomatic; however, some are born with severe disease symptoms including low birth weight, heart or liver problems, and meningoencephalitis. Chagas disease infections among asymptomatic infants persist for life and are at risk for developing chronic Chagas disease, unless treated. Treatment should be initiated as soon as clinical diagnosis is made. Stillbirths also may occur. Infants born to seropositive mothers should be screened and treated promptly if infected.

Causative Agent

T. cruzi is a member of the trypanosomatidae family.

Differential Diagnosis

Differential diagnoses include: preseptal cellulitis, infectious mononucleosis, and acute HIV infection.

Laboratory Identification

Human testing

Acute Phase

PCR testing is most useful during the acute phase (first 8 weeks after exposure), for detecting congenital infection, or when monitoring immunosuppressed patients for reactivation of chronic infections (see transplantation monitoring below). After the acute phase, the parasite may not be detectable, so PCR is unreliable for diagnosis. Some commercial lab may have an IgM serology test. Due to specificity issues with the IgM test, we cannot conclude acute infection and further confirmation testing should be perused like PCR or smear to confirm acute infection.

Chronic Phase

For chronic phase testing or screening patients with chronic phase disease, serologic IgG tests are preferred. Many commercial laboratories are capable of conducting IgG serologic testing. The international standard for diagnosing chronic Chagas disease is positive for *T. cruzi* specific antibody on two serologic assays on two serologic assays with different formats using different antigen preparations. Because most commercial laboratories don't offer that, it is recommended that serologic positive tests from commercial labs be confirmed at the Centers for Disease Control and Prevention (CDC) through coordination with the Utah Department of Health (UDOH).

Transplantation Monitoring

Persons confirmed with chronic Chagas disease through prior testing, who undergo solid organ or bone marrow transplantation warrant the monitoring for reactivation of the parasite. Monitoring such patients consists of testing blood samples (microscopy and PCR) weekly for the first 2 months, twice monthly (biweekly) for month 3, and then monthly up to 4-6 months. Monitoring intervals may be lengthened if rejection is suspected, change in immunosuppression or unexplained illness. A positive PCR result does not indicate reactivation but rising parasite numbers by quantitative PCR in serial are strong indicators for reactivation. PCR testing is conducted at CDC through coordination with UDOH.

Blood Donation Testing

Blood donation screenings are highly sensitive tests, prone to false positive results, and are not approved for diagnosis. If a person has a positive test through a blood donation center, it is recommended that they counsel with their healthcare provider and be tested by IgG serology at a commercial laboratory. If IgG positive at the commercial laboratory, further testing may be conducted at CDC through coordination with UDOH.

Congenital Infection

Congenital infections are considered acute up to eight weeks of age and can be diagnosed by confirmatory tests (microscopy or PCR). Infants less than nine months of age who are epidemiologically-linked should be retested after nine months of age by serologic testing.

Identification of *T. cruzi* by microscopy including:

- Microscopic examination of *T. cruzi* by:
 - Wet mount – motile trypanosomes, **OR**
 - Thick & thin smears – Giemsa stain

- Isolation of the agent by
 - Culture (specialized media – NNN, LIT), **OR**
 - Inoculation into mice, **OR**
 - Xenodiagnoses

- Detection of *T. cruzi* DNA by polymerase chain reaction (PCR)
 - Parasitemia in chronic infection is usually low. As a result, the PCR assay has a low sensitivity (generally <50%).

- Diagnosis of chronic phase relies on IgG serologic test

Note: Serologic and microscopy examinations can be conducted at commercial laboratories in Utah. Patients that test positive by these methods should have confirmatory testing at CDC requested through UDOH. CDC PCR testing may be requested through UDOH.

Vector Identification and Testing

In cases where triatomine bites are recognized, it is requested that the bugs be identified by an entomologist. Contact UDOH for resources. Kissing bugs that have potentially exposed humans may be sent to CDC for *T. cruzi* testing. Bugs that are not known to have exposed humans can be sent to other commercial or university laboratories. If a bug is positively identified and found to be infected with *T. cruzi*, human testing should be performed on the exposed person by PCR.

Treatment

Antiparasitic treatment is recommended for people early in the course of infection (acute phase), congenital infection, and for those who are immunocompromised. Many patients with chronic infection may also benefit from treatment. The two drugs used to treat *T. cruzi* infection are nifurtimox and benznidazole. Benznidazole is approved by the Food and Drug Administration (FDA) for use in children 2–12 years of age and is commercially available. Nifurtimox is not currently FDA approved and is available under investigational protocol from CDC. Neither drug is available in pediatric doses, so the tablets should be prepared in a compounding pharmacy to provide appropriate dose. Both drugs may cause significant side effects that some patients may not tolerate. Find additional treatment information at https://www.cdc.gov/parasites/chagas/health_professionals/tx.html.

Table 1: Antiparasitic Treatment

Drug	Age group	Dosage and duration
Benznidazole	<12 years	5–7.5 mg/kg per day orally in 2 divided doses for 60 days
	12 years or older	5–7 mg/kg per day orally in 2 divided doses for 60 days
Nifurtimox	≤10 years	15–20 mg/kg per day orally in 3 or 4 divided doses for 90 days
	11-16 years	12.5–15 mg/kg per day orally in 3 or 4 divided doses for 90 days
	17 years or older	8–10 mg/kg per day orally in 3 or 4 divided doses for 90 days

Case Fatality

Twenty to thirty percent of chronic patients develop cardiac or gastrointestinal complications that can be fatal. The case fatality rate in severely ill patients is about 10%.

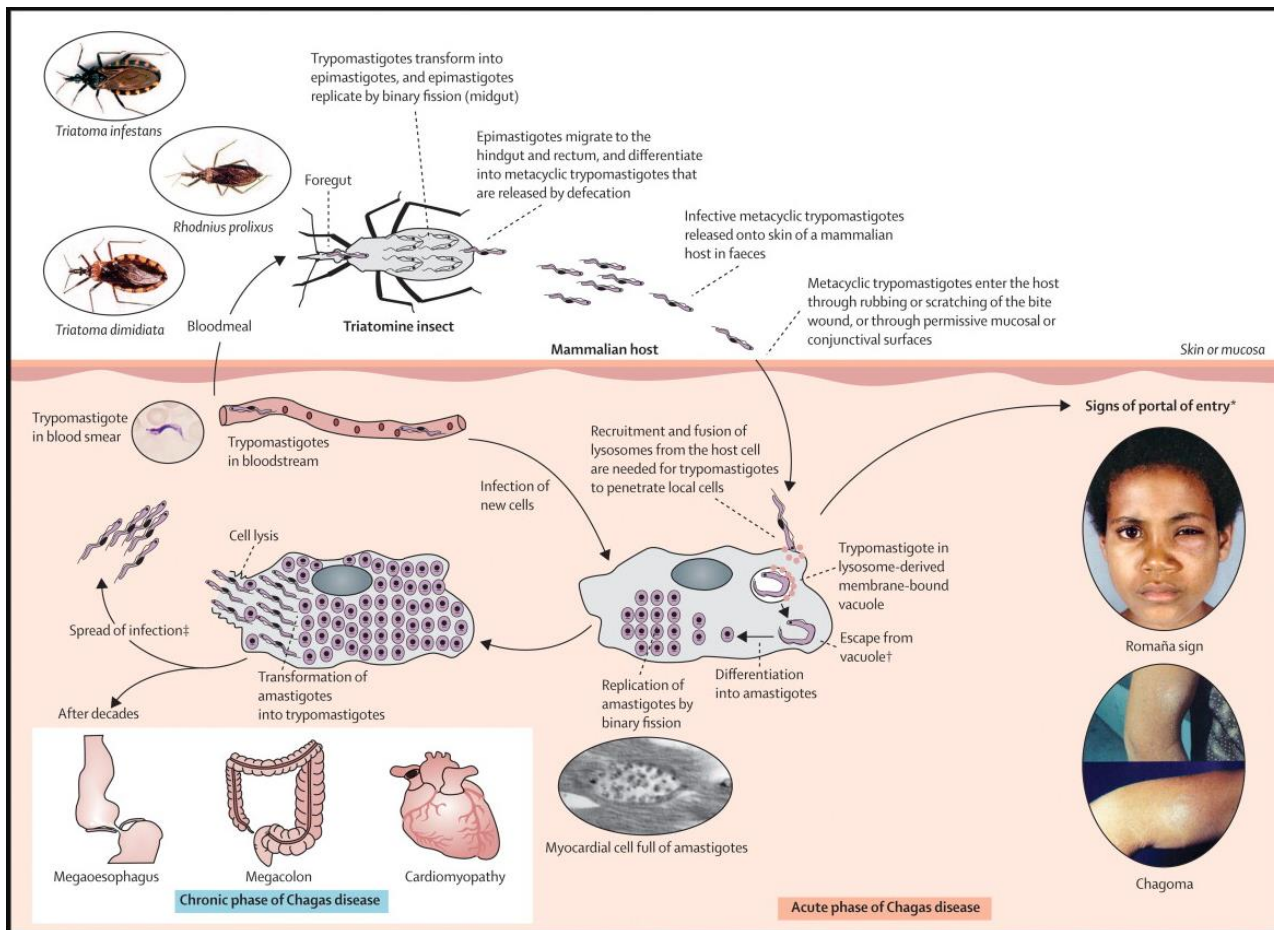
Reservoir

T. cruzi is a parasite spread by triatomine bugs (kissing bugs) in the Western Hemisphere. Humans and over 150 species of domestic and wild mammals, including dogs, cats, rodents, marsupials, bats, and primates serve as reservoirs. Birds and cold-blooded animals are resistant to infection (<https://online.epocrates.com/diseases/116024/Chagas-disease/Etiology>). Triatomine bugs usually emerge at night for blood meals from cracks in human dwellings or hide in nests or resting places of animals. The insect is called the “kissing bug” because it tends to feed around the mouth and eyes.

Transmission

The primary mode of transmission of parasite from bug to human is through infected fecal material perforating a bite wound, or scratched or rubbed into a person’s eyes, nose or mouth. Ingestion of food or drink contaminated by triatomine feces may also lead to infection. Other modes of transmission include congenital infection, blood transfusions, or organ transplants. In the U.S., whole blood and blood component products, except source plasma, are screened for *T. cruzi* per FDA guidance provided in 2010. At-risk organ donors and recipients are tested before transplant.

Figure 1: Chagas Life Cycle



Source: <https://ars.els-cdn.com/content/image/1-s2.0-S014067361060061X-gr1.jpg>

Susceptibility

All persons without prior infection are presumed to be susceptible. Although an immune response from a primary infection does occur, it does not solely protect a person against reinfection. Treatment from benznidazole has been shown to protect from reinfection.

Incubation Period

The incubation period for the acute phase of disease ranges from 5–14 days. Chronic manifestations do not appear for years to decades after infection. In transfusion or transplant-associated infection, the incubation period is between 2–3 months but can delay as long as six months.

Period of Communicability

Chagas disease is not typically spread from person-to-person. The kissing bug becomes infected 10–30 days after biting an infected host with infection lasting up to two years or the life of the bug. The parasite is present in the blood of infected animals or humans during the acute phase of infection and may persist in low levels in both symptomatic and asymptomatic hosts.

Epidemiology

The protozoan parasite *T. cruzi* is only found in the Americas and is present in many animal reservoirs. Many South American and Latin American countries are endemic for human and mammal Chagas disease. The parasite was first described in 1909 by Carlos Chagas in Brazil and was later found in California in 1916. Autochthonous transmission in the U.S. was first identified in 1955 in an infant in Texas and later found in California, Tennessee, and Louisiana. Due to cases being linked to blood transfusions, blood donation centers began screening all blood samples by January 2012.

Chagas disease became a reportable condition in Utah on August 1, 2018. There are 11 *Triatoma* species found in the U.S. and one species, *Triatoma protracta*, in Utah. The subspecies of the *Triatoma protracta* include the *Triatoma protracta protracta*, *Triatoma protracta navajoensis*, and *Triatoma protracta woodi*. This species has been documented to carry the parasite *T. cruzi* and to routinely feed on mammals and humans. These species have been documented in Utah as far back as 1966 in the Annual Review of Entomology. The Utah State University Plant Pest Diagnostic Lab has recorded identification of *T. protracta* since 1988 in Uintah County. More recently, *T. protracta* has been identified in Grand, Kane, Duchesne, Wayne, and Washington Counties. No testing was conducted on these bugs to determine potential infection of *T. cruzi*.

✓ PUBLIC HEALTH CONTROL MEASURES

Public Health Responsibility

- Identify the source of exposure and prevent further transmission.
- Investigate all suspect cases of disease and fill out and submit appropriate disease investigation forms.
- Provide education to the general public, clinicians, and first responders regarding disease transmission and prevention.
- Identify clusters or outbreaks of the disease.

Prevention

The best way to prevent Chagas disease is to eliminate or minimize human contact with kissing bugs.

To prevent kissing bugs around the home:

- Seal cracks and gaps around windows, walls, roofs, and doors.
- Remove wood, brush, and rock piles near your home.
- Use screens on doors and windows and repair any holes or tears.
- Seal up holes and cracks leading to the attic, crawl space below the house, and to the outside.
- Have pets sleep indoors, especially at night.
- Make sure yard lights are not close to your house thus attracting bugs.
- Keep your house and any outdoor pet resting areas clean, and periodically check both areas for the presence of bugs.

Chemoprophylaxis

None.

Vaccine

None.

Isolation and Quarantine Requirements

Isolation: None.

Hospital: None.

Quarantine: None.

✓ CASE INVESTIGATION

Reporting

Report all suspect and confirmed cases of Chagas disease.

Case Definition

Acute phase

Confirmed: A clinically compatible case with supportive laboratory testing* and documented exposure** <8 weeks before illness onset or diagnosis

Probable: A case (asymptomatic or symptomatic) <8 weeks before illness onset or diagnosis that has confirmatory laboratory testing

Chronic phase

Confirmed: A clinically compatible case with supportive laboratory testing* and documented exposure** >8 weeks before illness onset or diagnosis.

Probable: A case (asymptomatic or symptomatic) >8 weeks before illness onset or diagnosis that has confirmatory laboratory testing.

*Supportive laboratory testing includes:

- Positive diagnostic serology for *T. cruzi* IgG antibodies, **OR**
- Positive blood donor screening test PLUS a positive supplemental test

**Documented exposure may include history of travel to an endemic country.

Case Investigation Process

- Complete CMR in UT-NEDSS/EpiTrax.
- Verify case status.
- Complete disease investigation form.
- Determine whether patient had travel/exposure history consistent with acquisition of disease in Utah or elsewhere.
- If patient acquired disease in Utah, identify the source of transmission and assist with eliminating it.

Outbreaks

More than one case of Chagas disease with a common exposure constitutes an outbreak.

Identifying Case Contacts

This disease is not spread from person-to-person.

✓ REFERENCES

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✓ VERSION CONTROL

12/05/2019: Updated Laboratory Identification section.

07/19/2019: Updated disease plan per reviewer suggestions.

06/03/2019: Updated disease plan per reviewer suggestions.

11/29/2018: Created new disease plan.

✓ CHAGAS DISEASE RULES FOR ENTERING LABORATORY TEST RESULTS

The following rules describe how laboratory results reported to public health should be added to new or existing events in UT-NEDSS/EpiTrax. These rules were developed for the automated processing of electronic laboratory reports, although they apply to manual data entry, as well.

Test-Specific Rules

Test specific rules describe what test type and test result combinations are allowed to create new morbidity events in UT-NEDSS/EpiTrax, and what test type and test result combinations are allowed to update existing events (morbidity or contact) in UT-NEDSS/EpiTrax.

Test Type	Test Result	Create a New Event	Update an Existing Event
IgG Antibody	Positive	Yes	Yes
	Negative	No	Yes
	Equivocal	Yes	Yes
IgM Antibody	Positive	Yes	Yes
	Negative	No	Yes
	Equivocal	Yes	Yes
PCR/amplification	Positive	Yes	Yes
	Negative	No	Yes
	Equivocal	Yes	Yes

Whitelist Rules

Whitelist rules describe how long an existing event can have new laboratory data appended to it. If a laboratory result falls outside the whitelist rules for an existing event, it should not be added to that event, and should be evaluated to determine if a new event (CMR) should be created.

Chagas disease Morbidity Whitelist Rule: If the specimen collection date of the laboratory result is two years or less after the event date, the laboratory result should be added to the morbidity event.

Chagas disease Contact Whitelist Rule: Never added to a contact event.

Graylist Rule

We often receive laboratory results through ELR that cannot create cases, but can be useful if a case is created in the future. These laboratory results go to the graylist. The graylist rule describes how long an existing event can have an old laboratory result appended to it.

Chagas disease Graylist Rule: If the specimen collection date of the laboratory result is 30 days before to seven days after the event date of the morbidity event, the laboratory result should be added to the morbidity event.

Other Electronic Laboratory Processing Rules

If an existing event has a state case status of “not a case,” ELR will never add additional test results to that case. New labs will be evaluated to determine if a new CMR should be created.

✓ UT-NEDSS/EpiTrax Minimum/Required Fields by Tab

Demographic

- Birth gender
- County
- Date of birth
- Ethnicity
- Race
- Last name
- First name
- State

Clinical

- Date diagnosed
- Date of death
- Died
- Disease
- Onset date
- Hospitalized
- Symptoms
 - Fever
 - Malaise
 - Nausea/vomiting
 - Diarrhea
 - Dizziness
 - Lymphadenopathy
 - Chest Pain
 - Cardiac arrhythmias
 - Palpations
 - Myocarditis
 - Difficulty breathing
 - Romana's sign
 - Chagoma
 - Hepatosplenomegaly
 - Other symptoms or clinical signs
- Pregnant
- Estimated due date

Laboratory

- Organism
- Specimen source
- Test result

- Test type
- Laboratory
- Collection date

Investigation

- Imported from
- Date of exposure
- Blood donor
- Date of donation
- Name of blood bank
- Has the patient ever had a blood transfusion?
 - Date of transfusion
 - Blood transfusion location?
- Triatomids present at patient's residence?
- History of contact with triatomines?
- Are dogs present at the patient residence?
- Has the patient ever lived outside of the U.S. for longer than 30 days?
- Did the patient travel outside of his/her country of residence within 60 days of onset?

Contacts

- NA

Reporting

- Date first reported to public health

Administrative

- State case status