Chaga's disease (South American Trypanosomiasis)

Chagas disease, also known as American trypanosomiasis, is a **tropical parasitic illness** caused by the protozoan *Trypanosoma cruzi* . It is endemic to **Central and South America** and is primarily transmitted to humans by **triatomine bugs** (also known as “kissing bugs”).

Epidemiology

- Affects approximately **6–7 million people globally** .
- Most prevalent in **rural and poor housing areas** in Latin America.
- Increasingly seen in non-endemic regions (e.g., the U.S., Europe) due to migration.

Life Cycle and Pathogenesis

Vector: *Triatomine bugs* (Reduviidae family) transmit the parasite through **contaminated feces** , not the bite itself.

Life Cycle Steps:

1. **Triatomine bug** feeds on human blood, defecating near the bite site.
2. **Metacyclic trypomastigotes** in the feces are introduced via:
    - Scratching the bite site,
    - Contact with mucous membranes (e.g., conjunctiva),
    - Transplacental transmission,
    - Blood transfusion or organ transplantation,
    - Ingestion of contaminated food or drinks.
3. In the host:
    - Parasites **invade various cell types** , especially **cardiac and smooth muscle** .
    - Multiply intracellularly as **amastigotes** , forming **pseudocysts** .
    - Cells rupture, releasing **trypomastigotes** into the bloodstream ? infect more cells.

Pathogenesis:

- Acute damage from **cell lysis and inflammation** .
- Chronic damage due to:
    - Persistent low-level infection,
    - **Autoimmune responses** ,
    - **Neuronal destruction** , especially of the **enteric nervous system** and **myocardium** .

Modes of Transmission

- **Vector-borne** : Feces of triatomine bug (most common).
- **Vertical transmission** : Congenital (transplacental).

- **Blood transfusion or organ transplant** .
- **Oral transmission** : Ingestion of food or drink contaminated with infected bug feces.
- **Laboratory accidents** .

Clinical Manifestations

1. Acute Phase (first 4–8 weeks)

- Often **asymptomatic** (in ~70% of cases).
- Symptoms (when present):
  - **Fever** , malaise, lymphadenopathy,
  - **Hepatosplenomegaly** ,
  - **Chagoma** : Inflammatory nodule at inoculation site,
  - **Romaña's sign** : Unilateral periorbital edema if entry is via conjunctiva,
  - **Myocarditis** and **meningoencephalitis** (in severe pediatric cases).

? **Note** : Parasitemia is highest during this stage, aiding in diagnosis.

2. Indeterminate Phase

- Lasts for **years or decades** .
- Patients are **asymptomatic** , but parasites persist in tissues.
- 60–70% remain in this phase for life.

3. Chronic Chagas Disease (10–30% of cases)

Develops **10–20 years** after initial infection.

Cardiac Manifestations (most common)

- **Dilated cardiomyopathy** ,
- **Arrhythmias** (especially right bundle branch block),
- **Apical aneurysms** ,
- **Heart failure** ,
- **Thromboembolism** , sudden cardiac death.

Gastrointestinal Manifestations

- **Megaesophagus** ? Dysphagia, aspiration.
- **Megacolon** ? Severe constipation, abdominal distension.
- Due to destruction of **enteric plexus neurons** .

Reactivation (in immunosuppressed individuals)

- Seen in **HIV/AIDS** , transplant recipients.
- Presents as **meningoencephalitis or myocarditis** .

Diagnosis

Acute Phase

- **Microscopy** : Trypomastigotes seen on **peripheral blood smear** .
- **PCR** : High sensitivity for parasite DNA.
- **Culture or xenodiagnosis** in specialized labs.

Chronic Phase

- **Serology (IgG)** : ELISA and indirect immunofluorescence assay (IFA).

  ? **At least two serological tests** with different principles are recommended.

- PCR may assist but has **lower sensitivity** in this phase.

Treatment

Antiparasitic Therapy

Most effective in the **acute and congenital** phases.

Drug	Mechanism	Notes
Benznidazole	Produces reactive radicals to damage parasite DNA	First-line; better tolerated
Nifurtimox	Generates oxidative stress	More side effects (GI, neurological)

- **Duration** : 60–90 days.
- **Cure rate** : ~60–80% in acute infections.
- **Limited efficacy in chronic phase** , but may **reduce disease progression** in early chronic stage.

  ? **Contraindications** : Pregnancy, severe hepatic/renal failure.

Supportive Management

- **Heart failure or arrhythmia** : Managed per cardiology guidelines.
- **Pacemakers/ICDs** : For advanced conduction defects.
- **Surgical interventions** : For GI megasyndromes if symptomatic.

Prevention and Control

Vector Control

- Insecticide spraying (pyrethroids) in endemic areas.
- Improved housing (cement walls, sealed roofs).

Blood and Organ Screening

- Routine **screening** of donors in endemic and non-endemic regions with migrant populations.

Congenital Transmission

- Screen **pregnant women** from endemic areas.
- Treat infected neonates promptly.

High-Yield Notes (USMLE/NCLEX Style)

- ? *Trypanosoma cruzi* is transmitted by **fecal contamination** , not the bug bite.
- ?? Chronic phase often leads to **biventricular heart failure** , **apical aneurysm** , and **sudden death** .
- ? **Romaña's sign** is a key indicator of acute Chagas if entry is via the eye.
- ? **Benznidazole** is first-line for acute and early chronic disease.
- ? Prevention focuses on **vector control and housing improvement** .
- ?? Always **screen blood donors and pregnant women** in endemic populations.