

NOTES
TRYPANOSOMA

GENERALLY, WHAT ARE THEY?

PATHOLOGY & CAUSES

- Genus of flagellated parasitic protozoa

Morphology
- Elongated body
- *Flagellum:* forms undulated membrane along body
- *Kinetoplast:* functions as mitochondrion

Transmission
- Through vectors
- *Incubation period:* 1–2 weeks

SIGNS & SYMPTOMS

- See individual pathogens

DIAGNOSIS

- Direct microscopy
- Serologic testings
- Laboratory findings
- Additional diagnostic tests may be necessary (severity, infection site-dependent)

TREATMENT

- See individual pathogens

TRYPANOSOMA BRUCEI

osms.it/trypanosoma-brucei

PATHOLOGY & CAUSES

- Protozoan, extracellular parasite → African trypanosomiasis
- AKA "sleeping sickness"
  - Neurologic alterations during meningoencephalitis stage (e.g. somnolence)

Virulence factors
- Antigenic variation
  - Changes variant surface glycoprotein (VSG) → immune response evasion
- ↑ interferon gamma → ↑ host *T. brucei* susceptibility (mechanism unknown)

Morphologic forms (life-cycle)
- Epimastigote → procyclic trypomastigote (in tsetse fly midgut) → metacyclic trypomastigote (infectious form)

Subspecies
- *Trypanosoma brucei rhodesiense* (acute, more severe disease course)
- *Trypanosoma brucei gambiense* (progressive, milder disease course)

Reservoirs
- Domestic animals, lions, hyenas, antelopes

Vector

- Male/female Glossina flies, AKA tsetse flies
  - *Ideal conditions:* warm, humid climate (e.g. near river/lake); altitude < 1800m/5905ft

Transmission

- Saliva inoculation via fly bite; vertical/parenteral transmission very rare
- *Endemic regions:* sub-Saharan Africa; Democratic Republic of Congo (most cases)

Pathogenesis

- *Glossina* bite → subcutaneous metacyclic trypomastigote inoculation → lymph vessels → bloodstream → ↑ tumor necrosis factor (TNF) alpha, interleukin 6 (IL-6), nitric oxide → ↑ capillary permeability → vasculitis → organ invasion, e.g. central nervous system (CNS)

Disease stages

- Hemolymphatic (early) stage
- Meningoencephalitis (late) stage
- Symptom severity related to number of organisms in affected tissue (e.g. blood, CNS)

RISK FACTORS

- Recent endemic area travel
- Dense vegetation near human settlement

COMPLICATIONS

- Meningitis
- Myocarditis, heart failure
- Aspiration → bacterial pneumonia; associated with altered state of consciousness (meningoencephalitis stage)

SIGNS & SYMPTOMS

Hemolymphatic stage

- Systemic symptoms
  - Intermittent fever, headache, malaise, weakness, pruritus, rash
- Trypanosomal chancre
  - Rubbery, painful, erythematous, well-circumscribed lesion at fly bite site approx. one week post-inoculation
- Lymphadenopathy
  - *Winterbottom's sign:* enlarged mobile, soft posterior cervical triangle lymph nodes
- Hepatosplenomegaly
- Dyspnea
- Chest pain
- Altered thyroid function
- Impotence (biologically-male), amenorrhea (biologically-female)
- Pain, Kerandel sign (deep hyperesthesia)

Meningoencephalitis stage

- AKA "Sleeping sickness"
- Cachexia
- Sleep disturbances (e.g. diurnal somnolence, nocturnal insomnia)
- Headaches
- Altered state of consciousness
- ↓ cognitive function
- Personality, behavioral change
- Muscle spasms, ataxia, tremor, flaccid paralysis, choreiform movements
- Psychiatric manifestations (e.g. psychosis)

DIAGNOSIS

DIAGNOSTIC IMAGING

MRI

- Cerebral
  - May show multifocal white matter hyperintensity (indicates late-stage disease)

LAB RESULTS

Serologic testings

- Card agglutination test for trypanosomiasis (CATT)
  - Blood + drop of reagent with trypanosomal antigen
- Immunofluorescence
- Enzyme immunoassays

Cerebrospinal fluid (CSF) examination

- Disease staging essential
- ↑ leukocytes
- ↑ proteins
- IgM/*Trypanosoma* presence

- Morula/Mott cells (pathognomonic)
  - IgM-filled plasma cells

Direct microscopy

- Organism observation in lymph node aspiration, bone marrow, CSF, blood (thin/thick Giemsa-stained smears)

Laboratory findings

- Hemolytic anemia; leukocytosis; thrombocytopenia; ↑ erythrocyte sedimentation rate; hypergammaglobulinemia; hypoalbuminemia, hypocomplementemia; ↑ C-reactive protein; coagulation abnormalities

Histological observation

- Meningoencephalitis stage (CSF sample)
  - Morula/Mott cells in white matter (pathognomonic), edema, microhemorrhages, perivascular proliferation

OTHER DIAGNOSTICS

Electroencephalogram (EEG)

- *Late stage:* abnormal, slow delta waves

TREATMENT

MEDICATIONS

- Antiprotozoal medication
  - *Hemolymphatic stage:* pentamidine, suramin
  - *Meningoencephalitis stage:* eflornithine, eflornithine + nifurtimox, melarsoprol

OTHER INTERVENTIONS

- Prevention
  - Vector control, surveillance
  - Protective clothing

TRYPANOSOMA CRUZI

osms.it/trypanosoma-cruzi

PATHOLOGY & CAUSES

- Protozoan, intracellular parasite
  - Causes American trypanosomiasis, AKA Chagas disease
- Morphologic forms (life cycle)
  - Amastigote (intracellular, no flagellum) → epimastigote (in triatomine midgut) → trypomastigote (infectious form)
- Reservoirs
  - Opossums, armadillos, canines
- Vectors
  - Triatomine bugs ("kissing bugs")
  - *Common species:* *Rhodnius prolixus*, *Triatoma dimidiata*, *Triatoma infestans*
  - *Characteristics:* size (2–3cm/0.79–1.18in); obligated hematogenous; feeds at night; lives in dark, warm sites (e.g. closets, thatched roofs)

Transmission

- Triatomine bite → fecal wound contamination
- Contaminated food/water ingestion (infection through mucous membranes)
- Parenteral (e.g. blood transfusion, sharing syringes)
- Vertical (mother → fetus)

Endemic regions

- Rural areas of southern U.S., Latin America

Pathogenesis

- *T. cruzi* trypomastigote inoculation → bloodstream → organ invasion (heart, enteric nervous system) → interstitial inflammation → tissue destruction → fibrosis

Disease stages

- *Acute phase:* 8–12 weeks
- *Indeterminate phase:* decades

- *Chronic phase:* cardiac/gastrointestinal disease

RISK FACTORS

- Recent endemic area travel, immunosuppression, blood transfusion, organ transplant, intravenous drug use

COMPLICATIONS

- Heart failure, acute myocarditis, meningoencephalitis, systemic/pulmonary embolism, sudden death



Figure 104.1 The kissing bug, *Triatoma infestans*, is found in Central and South America and is a vector for Chagas disease.

SIGNS & SYMPTOMS

Acute phase

- Mostly asymptomatic
- *Systemic:* malaise, fever, anorexia, headaches
- *Chagoma:* nodular skin lesion at infection site; usually on face/extremities
- *Romaña's sign:* unilateral eyelid edema, conjunctivitis, preauricular lymphadenitis; follows conjunctival inoculation
- Lymphadenopathy
- Hepatosplenomegaly

Indeterminate phase

- Asymptomatic

Chronic phase

- *Cardiac manifestations:* dyspnea, fatigue, palpitation, chest pain, edema, mitral/tricuspid regurgitation murmur, splitting of S2
- *Gastrointestinal manifestations:* megacolon (constipation, bloating, abdominal pain); megaesophagus (dysphagia, regurgitation)

Congenital disease

- *Systemic:* low birthweight, anasarca, fever
- Petechiae
- Hepatosplenomegaly
- Neurologic abnormalities (e.g. hypotonia, tremor)

DIAGNOSIS

DIAGNOSTIC IMAGING

- *Further studies:* stage, clinical syndrome dependent

Chest X-ray, MRI, echocardiogram

- Enlarged cardiac silhouette (cardiomegaly)
- Pericardial effusion
- Valvular regurgitation
- Left ventricular aneurysm

Barium studies

- Megacolon, megaesophagus

LAB RESULTS

- Polymerase chain reaction (PCR)

- Blood culture

Direct microscopy

- Organism observation in thin/thick blood smears; for acute phase disease (high parasitemia)

Serologic testing

- E.g. enzyme-linked immunosorbent assay (ELISA), immunofluorescence

Xenodiagnosis

- Feed laboratory triatomes with person's blood → examine feces weeks later

Cardiac tissue microscopy

- *Acute disease:* intracellular pseudocysts (amastigotes inside myocardiocytes), interstitial inflammation
- *Chronic disease:* mural thrombi, interstitial fibrosis, myocardiocyte necrosis

OTHER DIAGNOSTICS

ECG

- *Arrhythmia evidence:* bundle branch/AV block

TREATMENT

MEDICATIONS

- Antitrypanosomal treatment
- *Advanced cardiac disease:* cardiac arrest prevention, ventricular fibrillation through antiarrhythmic medication

OTHER INTERVENTIONS

Prevention

- Vector control, treat parasitemia before conception

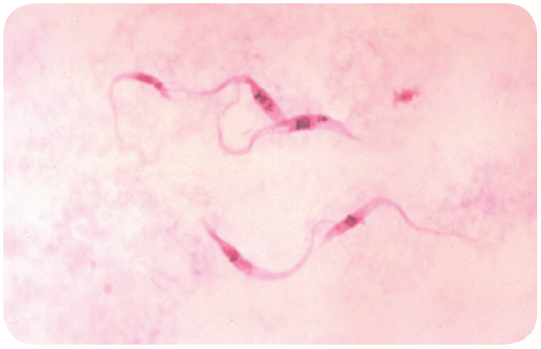


Figure 104.2 *Trypanosoma* species seen on a peripheral blood smear from an individual with Chagas disease.