

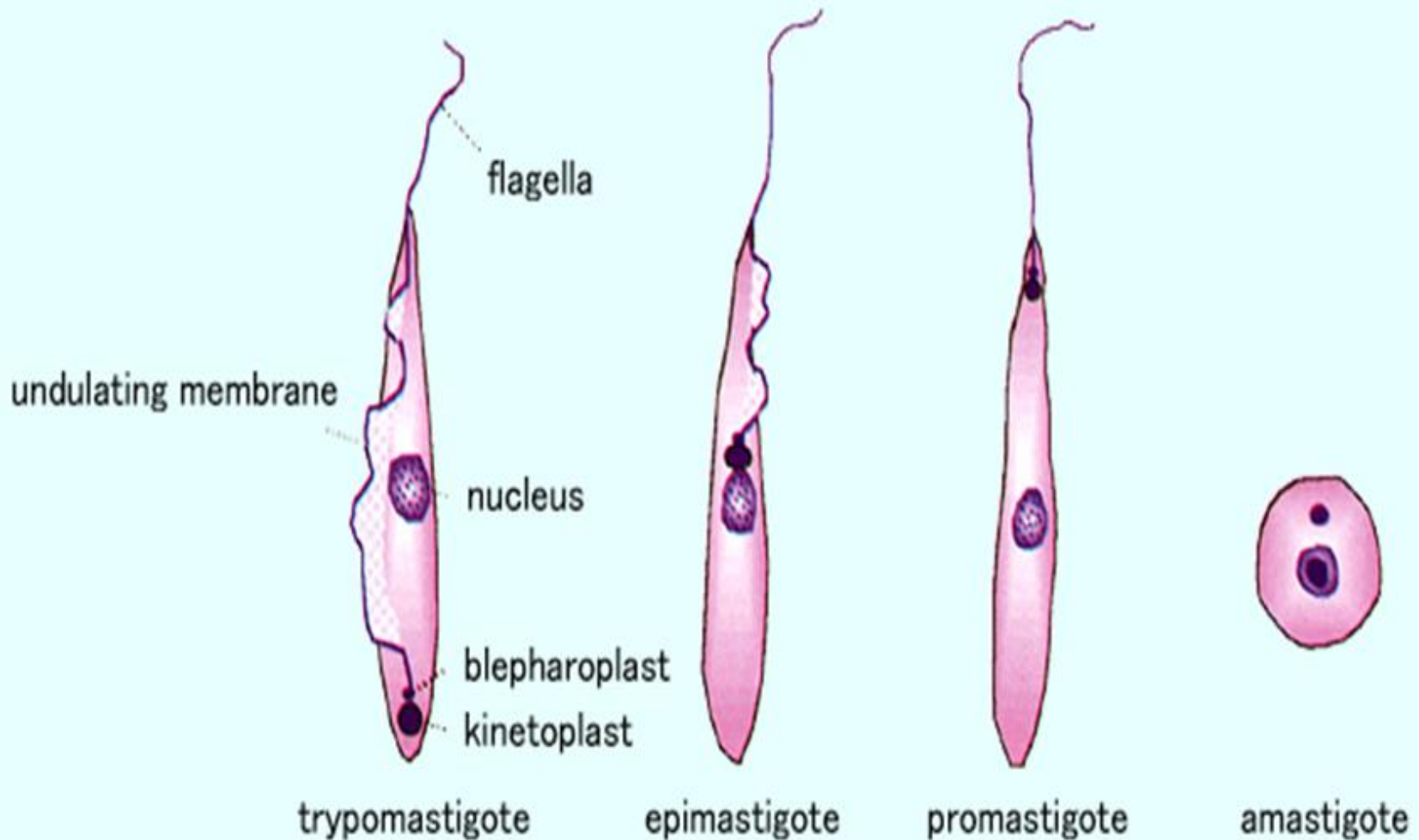


Haemoflagellate

Trypanosomiasis

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Different stages of Hemoflagellates



Trypanosomiasis

- There are two types of trypanosomiasis that affect humans, they are divided according to their geographical location :
 - *African trypanosomiasis*, or **sleeping sickness**, is caused by *Trypanosoma brucei* parasites in Africa and is transmitted by the **tsetse fly**.
 - *American trypanosomiasis*, or **Chagas disease**, is caused by *Trypanosoma cruzi* parasites in Latin America and is transmitted by the '**kissing**' bug.

1-African sleeping sickness

Trypanosoma brucei rhodesiense:

East Africa, wild and domestic animal reservoirs

Trypanosoma brucei gambiense:

West and Central Africa,
mainly human infection

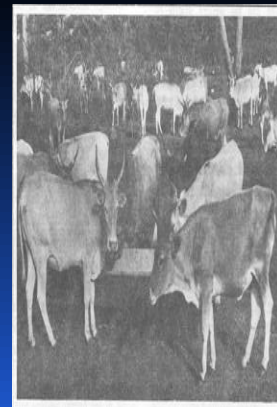
2-Chaga's disease in central and south America

Trypanosoma cruzi cause
Chaga's disease.

What is African sleeping sickness?

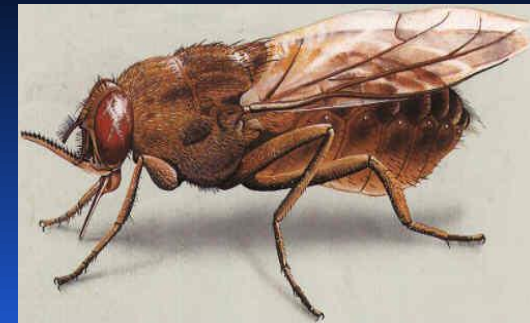


- *African trypanosomiasis is a parasitic disease. Infection occurs through the bite of infected tsetse flies (intermediate host). It gets its nickname 'sleeping sickness' because symptoms can include a disturbed sleep pattern. Humans, domestic cattle and wild animals are the main reservoir host for Trypanosoma (definitive host). T. gambiense causes a chronic illness . . . T. rhodesiense causes a more acute illness.*



How is African trypanosomiasis transmitted ?

- *Trypanosoma* are transmitted to human through the bite of the tsetse fly which is only found in rural parts of Africa.
- However, trypanosomes can also be transmitted from mother to child as the parasite can cross the placenta[?] in the blood and infect the baby while it is still in the womb[?].
- Contaminated needles can also contribute to the spread of trypanosomes, but this is rare.



Trypanosome life cycle

- The trypanosome parasite is first introduced into the mammalian host as **trypomastigotes** when a tsetse fly takes a blood meal and secretes parasite-filled saliva into the host's skin.
- Once in the bloodstream **the trypomastigotes** multiply in the blood, lymph or spinal fluid.

Tsetse fly Stages

Epimastigotes multiply in salivary gland. They transform into metacyclic trypomastigotes.

8

1 Tsetse fly takes a blood meal (injects metacyclic trypomastigotes)



i

5 Tsetse fly takes a blood meal (bloodstream trypomastigotes are ingested)



i

d

7 Procyclic trypomastigotes leave the midgut and transform into epimastigotes.

7

6 Bloodstream trypomastigotes transform into procyclic trypomastigotes in tsetse fly's midgut. Procyclic trypomastigotes multiply by binary fission.

6

Human Stages

2 Injected metacyclic trypomastigotes transform into bloodstream trypomastigotes, which are carried to other sites.

2

3 Trypomastigotes multiply by binary fission in various body fluids, e.g., blood, lymph, and spinal fluid.

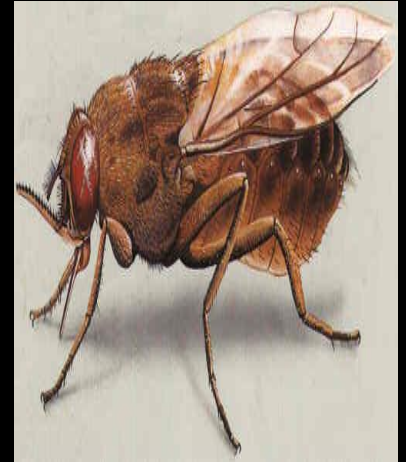
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4 Trypomastigotes in blood

4

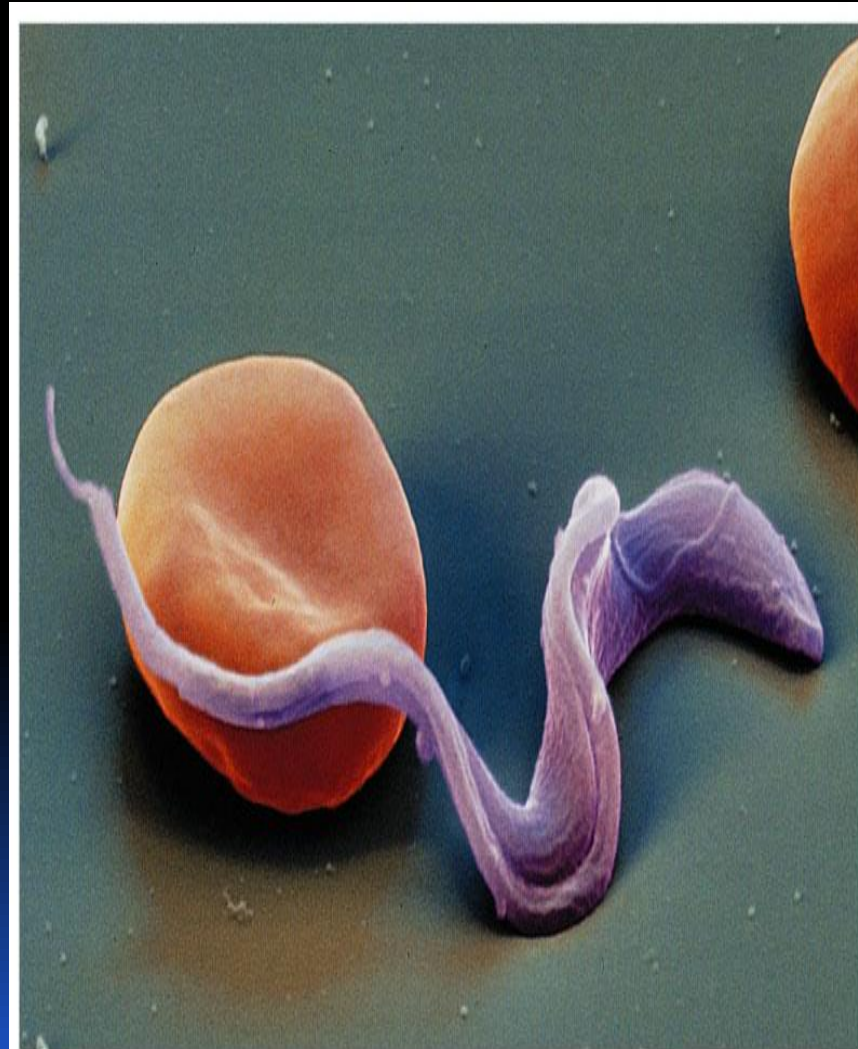


Tsetse fly
intermediate host, vector of
the trypanosoma



TRYPANOSOMIASSES

Trypomastigotes in the blood stream



Pathology and clinical picture

1. A primary reaction occurs at the site of inoculation of trypomastigotes ,skin stage, **chancre** which resolve in 2-3 weeks.



2. Systemic Haemato-lymphatic stage: **intermittent fever**, headache and generalized lymphadenopathy mainly in the cervical and sub occipital region (**Winterbottom's sign**) anemia .



3. Central nervous system stage (CNS):

This stage begins when the trypanosome parasites cross from the blood-brain barrier into the spinal fluid ,infecting the CNS including the brain, result in change in behavior ,confusion ,poor coordination ,difficulties with speech and disturbance of sleep (sleeping during day and insomnia at night).

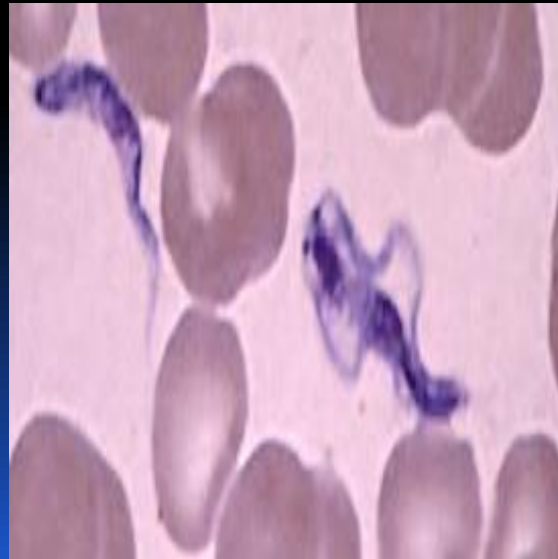
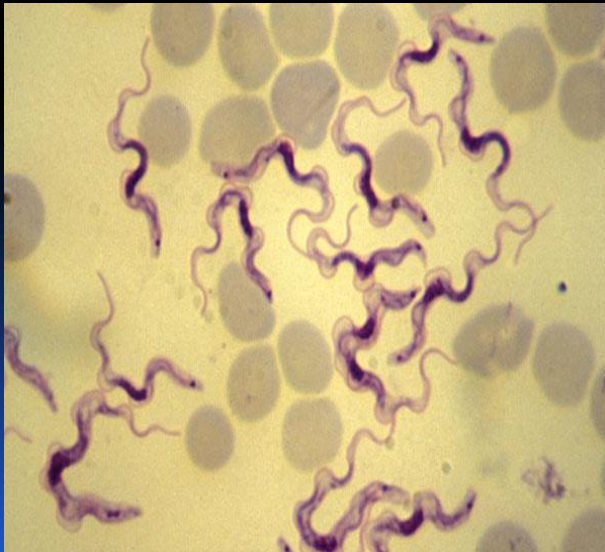
3rd stage CNS: CNS involvement in typical case there is daytime sleeping, psychological changes ,tremors ,convulsions and finally coma
Without treatment, the disease is invariably fatal.

CSF lumbar puncture for diagnosis



Diagnosis of African trypanosomiasis

- Diagnosis relies on recognition of the **trypomastigote** in peripheral blood during fever, sternal bone marrow, lymph node aspirates and CSF. Motile organisms may be visible in the buffy coat.
- Serological testing is also common as IF and ELIZA.



AMERICAN TRYPANOSOMIASIS

(Chaga's disease)



AMERICAN TRYPANOSOMIASIS

Triatomine Bug Stages

Human Stages

1 Triatomine bug takes a blood meal (passes metacyclic trypomastigotes in feces, trypomastigotes enter bite wound or mucosal membranes, such as the conjunctiva)

2 Metacyclic trypomastigotes penetrate various cells at bite wound site. Inside cells they transform into amastigotes.

Metacyclic trypomastigotes in hindgut

8

Multiply in midgut

7

Epimastigotes in midgut

6

5 Triatomine bug takes a blood meal (trypomastigotes ingested)

3 Amastigotes multiply by binary fission in cells of infected tissues.

Trypomastigotes can infect other cells and transform into intracellular amastigotes in new infection sites. Clinical manifestations can result from this infective cycle.

4 Intracellular amastigotes transform into trypomastigotes, then burst out of the cell and enter the bloodstream.

i = Infective Stage
d = Diagnostic Stage



<http://www.dpd.cdc.gov/dpdx>

LIFE CYCLE OF *Trypanosoma cruzi*

Reduviid (*Triatomine*) bug kissing bug



American trypanosomes (Chaga's disease)

- The parasites produce focal lymphangitis and oedema at the site of parasites entry (**chagoma**) after that parasites (trypomastigote) enter the blood stream and find there way ,mainly on the face near the eyelids ,it produces a swelling of the eye and temporal region with conjunctivitis (**ROMANA'S sign**) , and also find their way mainly the cardiac muscles cells . The most constant feature of the cardiac disease is cardiomyopathy , in severe cases can lead to partial or complete heart block which may lead to cardiac failure.
- NOTE: Parasite can be seen free in blood stream as (**TRYPTOMASTIGOT**) , but in the cardiac tissue it become in form of(**Amastigote**) at autopsy.

American trypanosomes

Chaga's disease

American trypanosomiasis, is a tropical parasitic disease caused by the *Trypanosoma cruzi*. It is spread mostly by insects known as "kissing bugs". The human disease occurs in two stages: an **acute** stage and **chronic** stage.

In the early stage, symptoms are typically either not present or mild, and may include fever, swollen lymph nodes, headaches, or local swelling at the site of the bite (chagoma). The most recognized marker of acute Chagas disease is called Romaña's sign, which includes swelling of the eyelids on the side of the face near the bite wound the bug feces were deposited or accidentally rubbed into the eye.



Ocular lesion (Romana's sign)



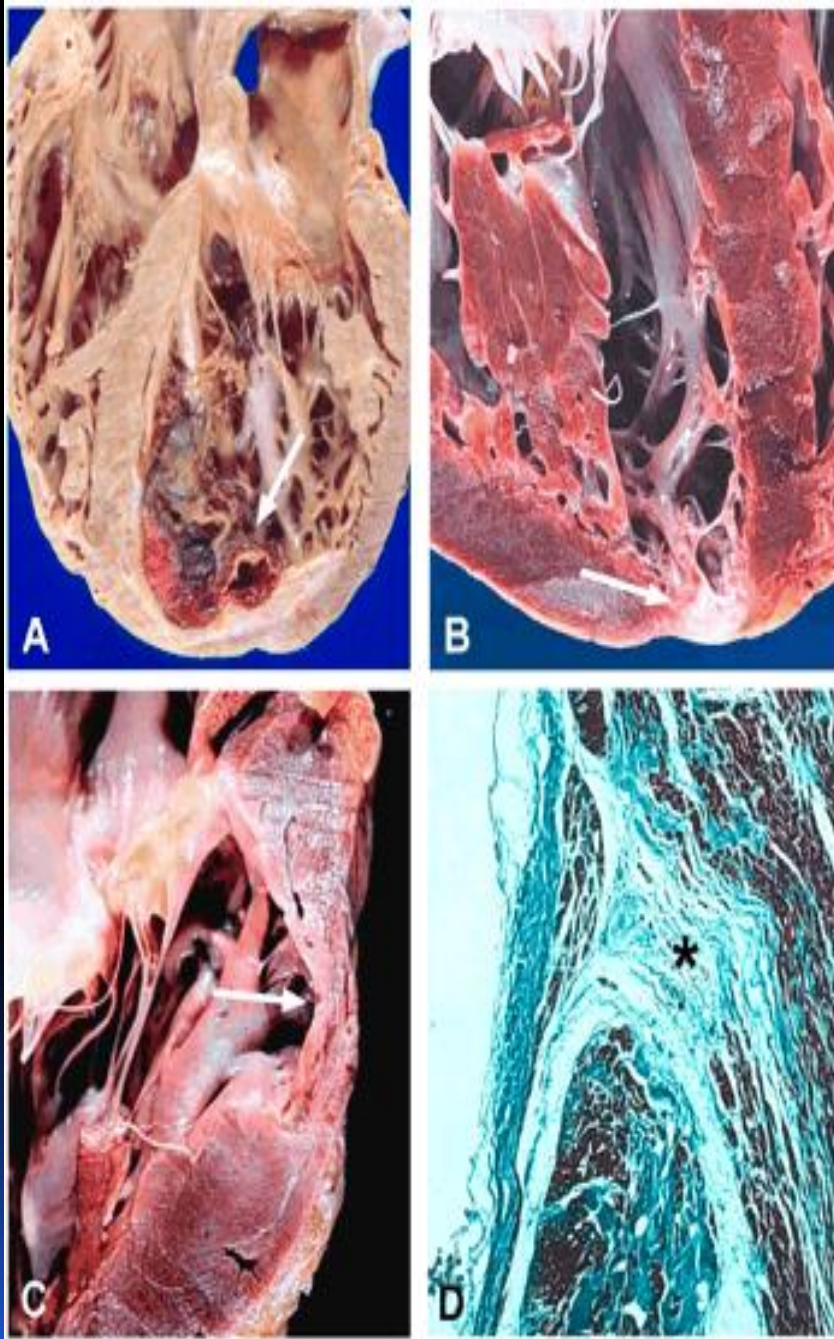
American trypanosomes

Chaga's disease



- *T. cruzi* causes a chronic illness with progressive myocardial damage leading to cardiac arrhythmias and cardiac dilatation, and gastrointestinal involvement leading to mega-oesophagus and megacolon. *T. cruzi* causes acute illness in children, which is followed by chronic manifestations later in life. , intracellular amastigotes destroy the intramural neurons of the autonomic nervous system in the intestine and heart, leading to mega intestine and heart aneurysms. If left untreated, Chagas disease can be fatal, in most cases due to complete heart muscle damage.

Heart damage due to American trypanosomiasis



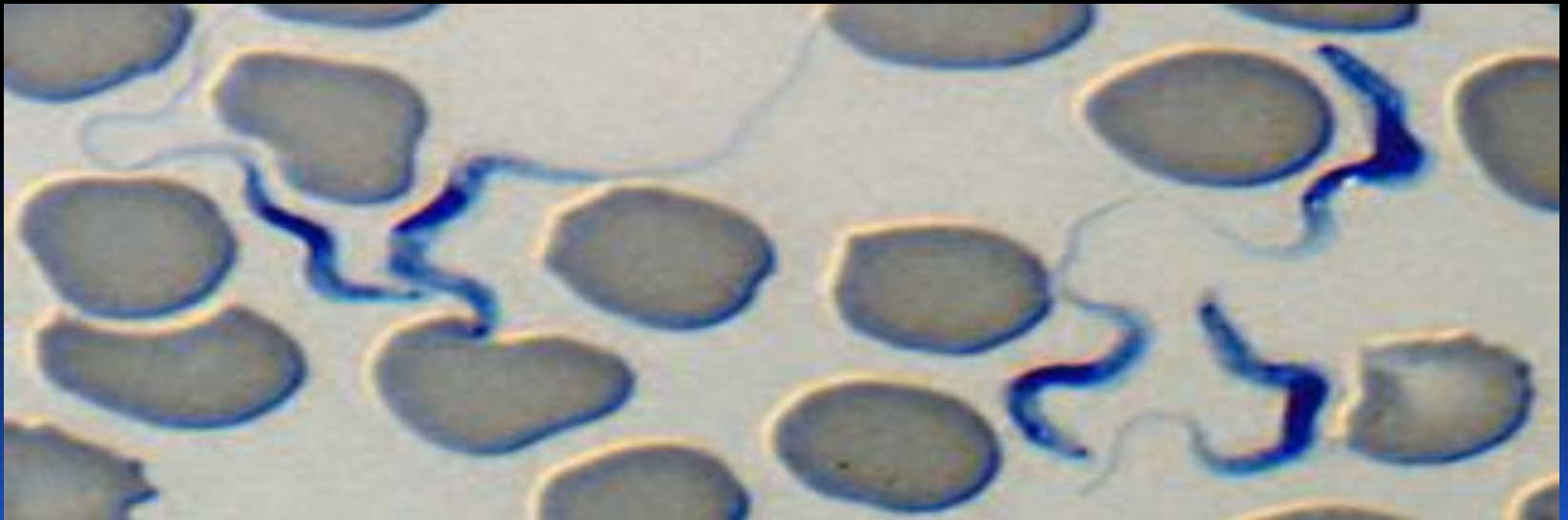
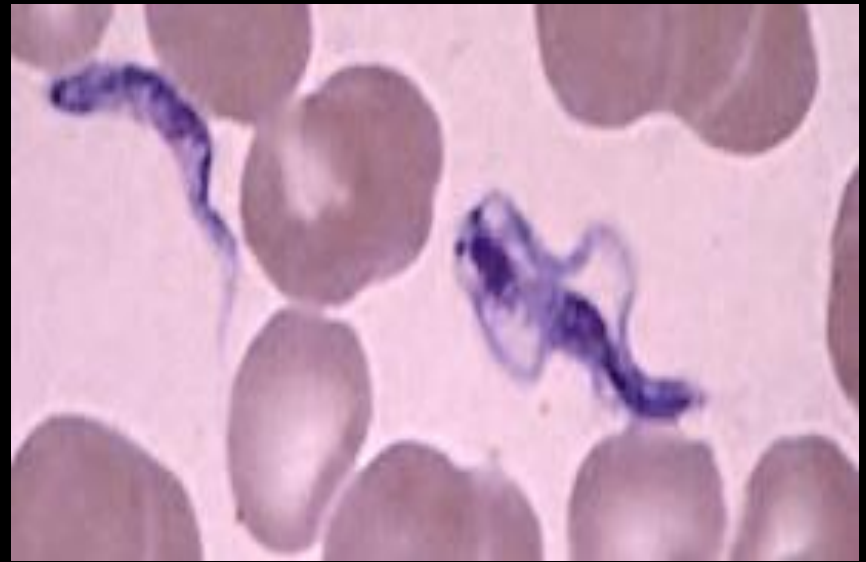
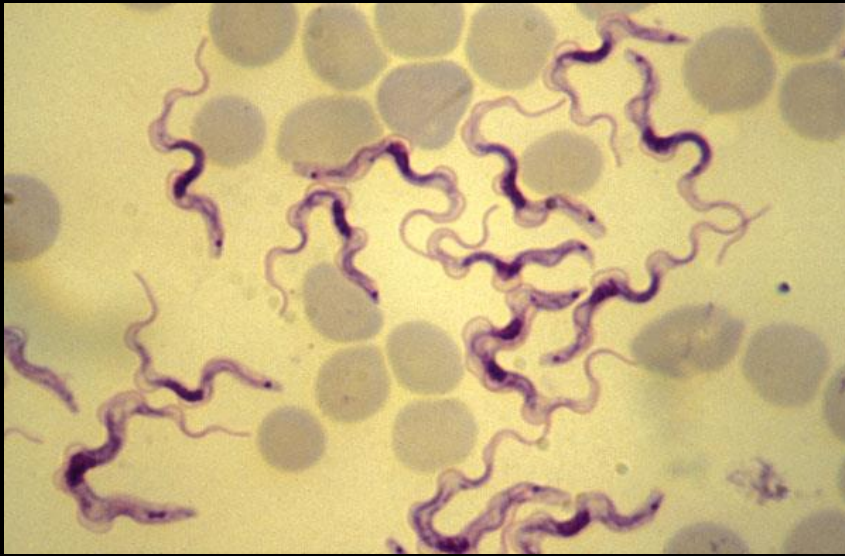
About two-thirds of people with chronic symptoms have cardiac damage, including dilated cardiomyopathy, which causes heart rhythm abnormalities and may result in sudden death.

Diagnosis

- Microscopical examination of Giemsa – stained blood.
- Serology: IFAT
- Xenodiagnosis: feeding bugs on a suspected cases.
- PCR used to detect trypomastigotes.



trypanosoma



TREATMENT OF TRYPANOSOMIASIS

African trypanosomiasis

For early infection

- pentamidine
- suramin

For late infection

- eflornithine (Diflouromethylornithine- DFMO)

American trypanosomiasis (Chaga's disease)

- benznidazole
- NITROFURAZONE .