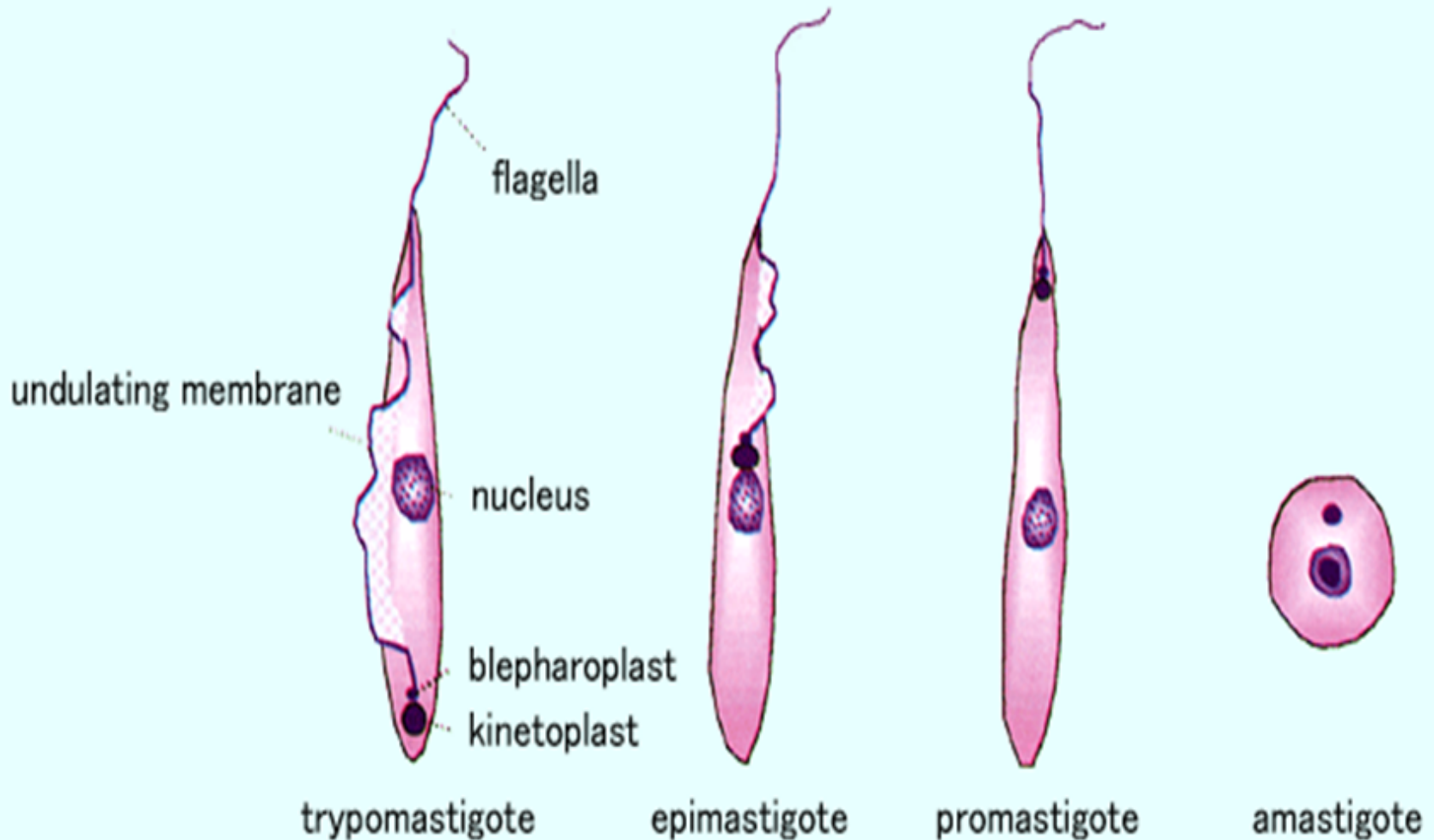




Haemoflagellates

Trypanosomiasis

Different stages of Haemoflagellates



Trypanosomiasis

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

1-African sleeping sickness

Trypanosoma brucei rhodesiense: East Africa,
wild and domestic animal reservoirs

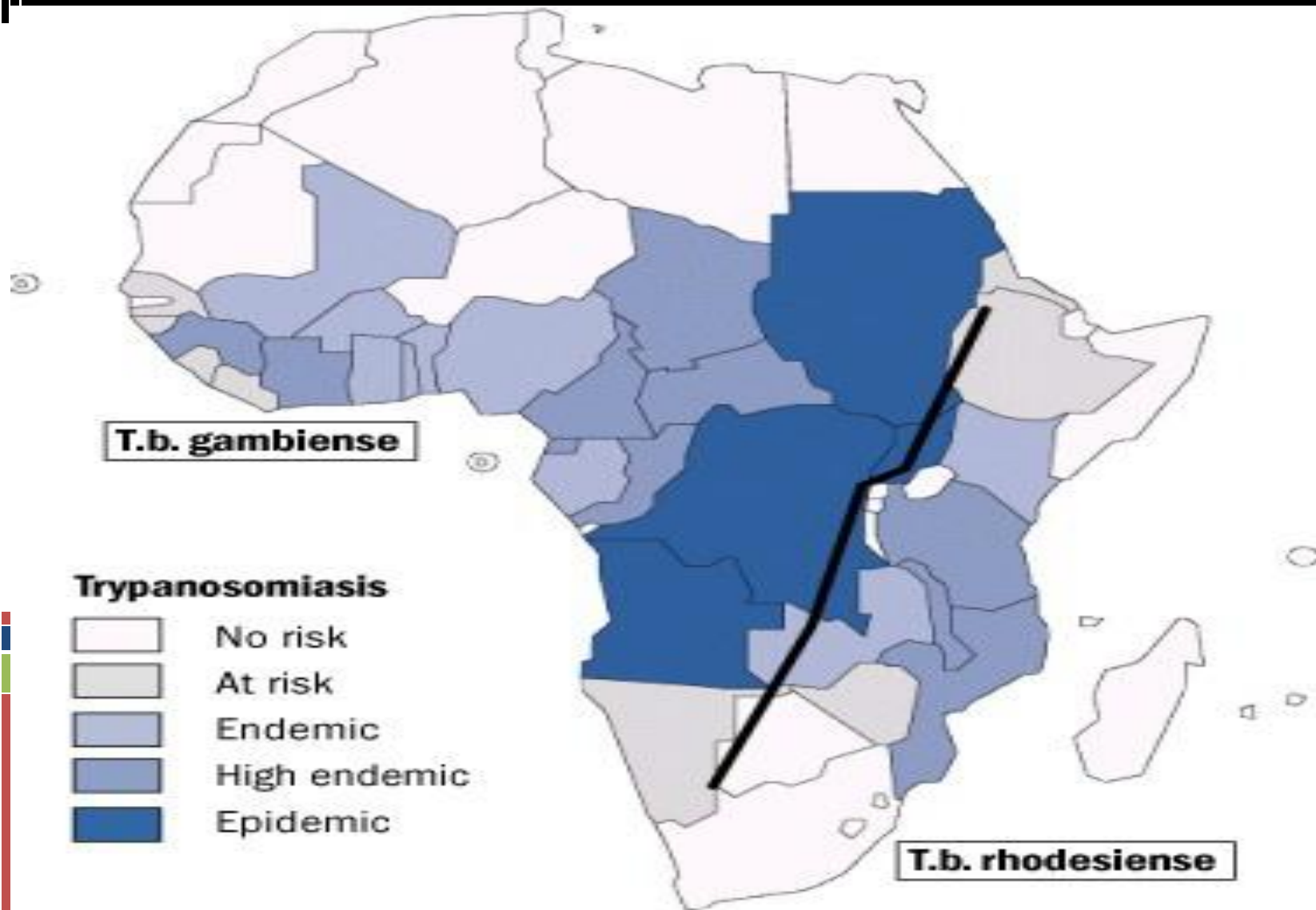
Trypanosoma brucei gambiense: West and
Central Africa, mainly human infection

2-Chagas disease (American trypanosomiasis)

Chagas disease in Central and South America

Trypanosma cruzi cause Chaga's disease.

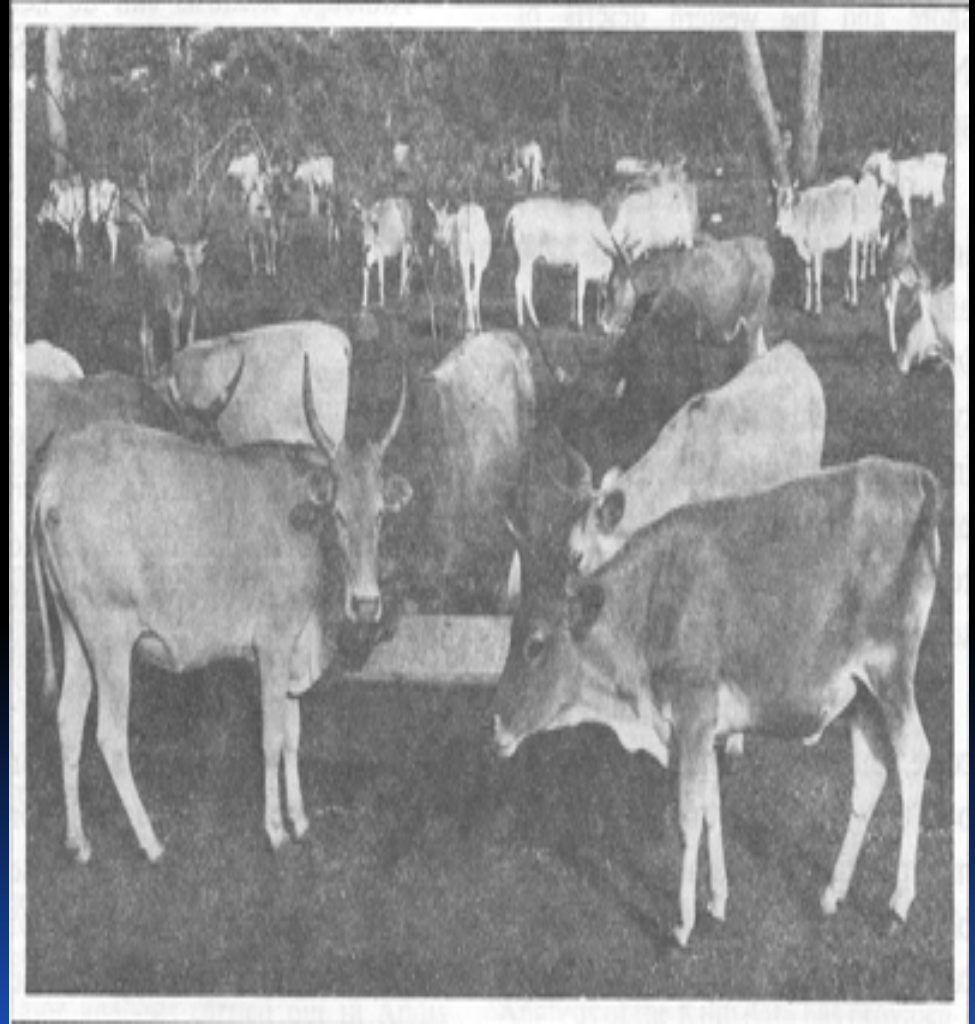
African sleeping sickness



What is African sleeping sickness?

- African trypanosomiasis is a parasitic disease transmitted by the tsetse fly. It gets its nickname ‘sleeping sickness’ because symptoms can include a disturbed sleep pattern.
- Infection occurs through the bite of infected tsetse flies (intermediate host). 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.

Animal reservoir hosts for African sleeping sickness



How is African trypanosomiasis transmitted ?

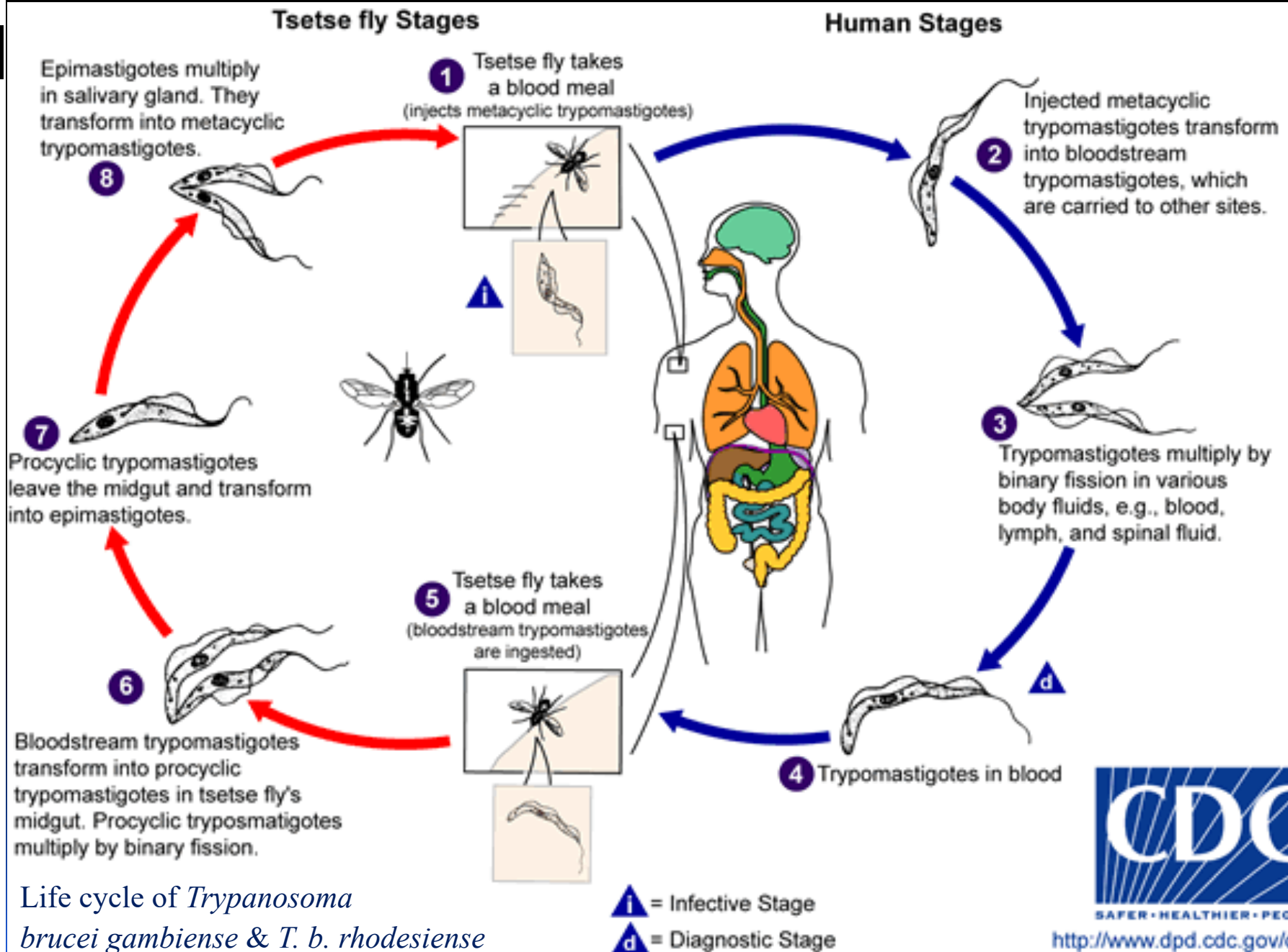
- *Trypanosoma* are transmitted from human to human through the bite of the tsetse fly which is only found in rural parts of Africa.
- However, trypanosomes can also be transmitted from mother to child as the parasite can cross the placenta[?] in the blood and infect the baby while it is still in the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



|| *Trypanosoma* 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.

African Trypanosomiasis



TRYPANOSOMIASES



Tsetse fly intermediate host



Pathology and clinical picture

1. Skin stage: A primary reaction occurs at the site of inoculation of trypomastigotes, **chancre** which resolve in 2-3 weeks.
2. Haematolymphatic stage: intermittent fever, headache and generalized lymphadenopathy mainly in the cervical and sub occipital region (**Winterbottom' 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 (**Meningoencephalitis**).

(Development of the disease more rapid in *Trypanosoma brucei rhodesiense*)

Chancre skin stage



Winterbottom's stage

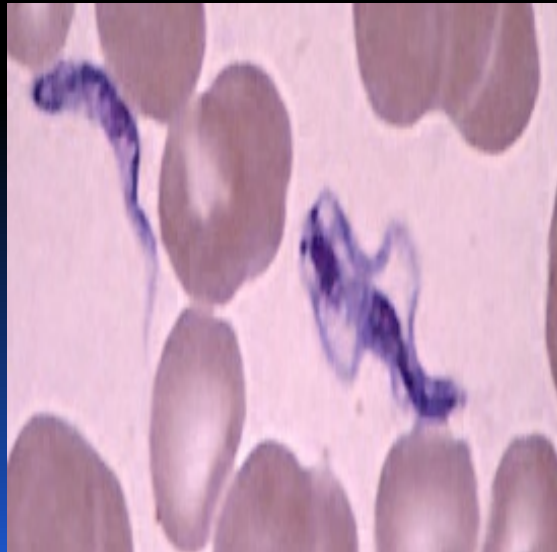
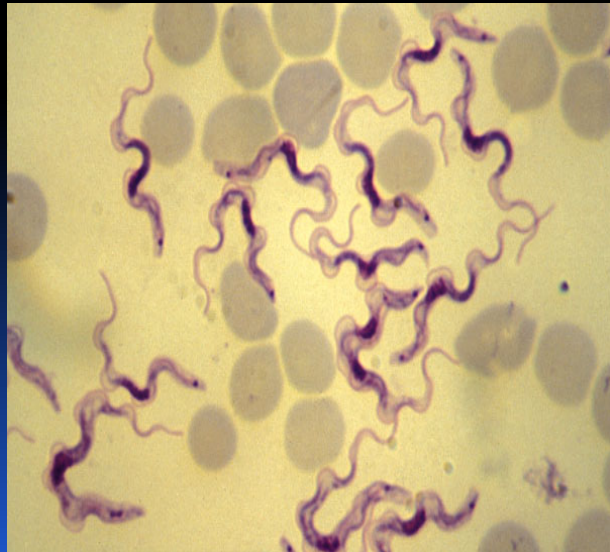


3rd stage CNS: CNS involvement in typical case there is daytime sleeping, psychological changes, tremors, convulsions and finally coma without treatment, the disease is invariably fatal.

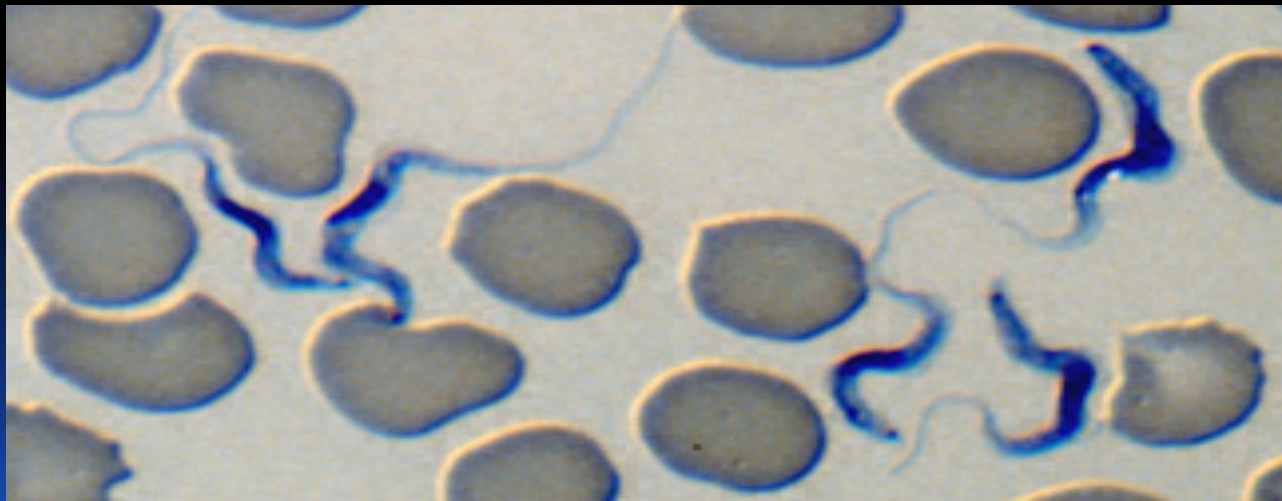
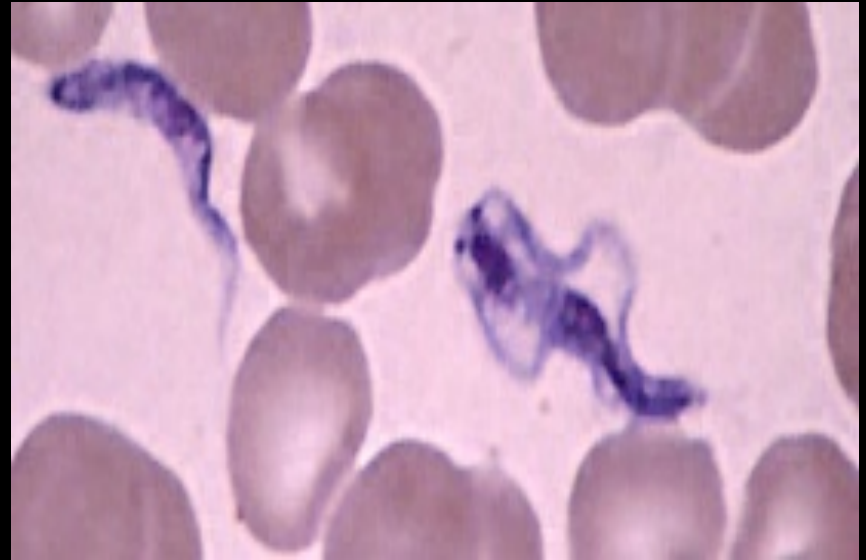
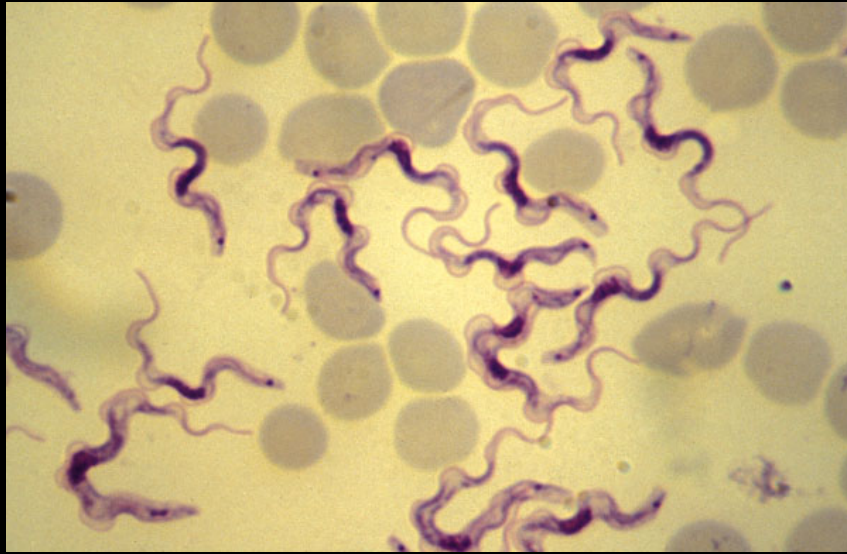


Diagnosis of African trypanosomiasis

- 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.



trypanosoma



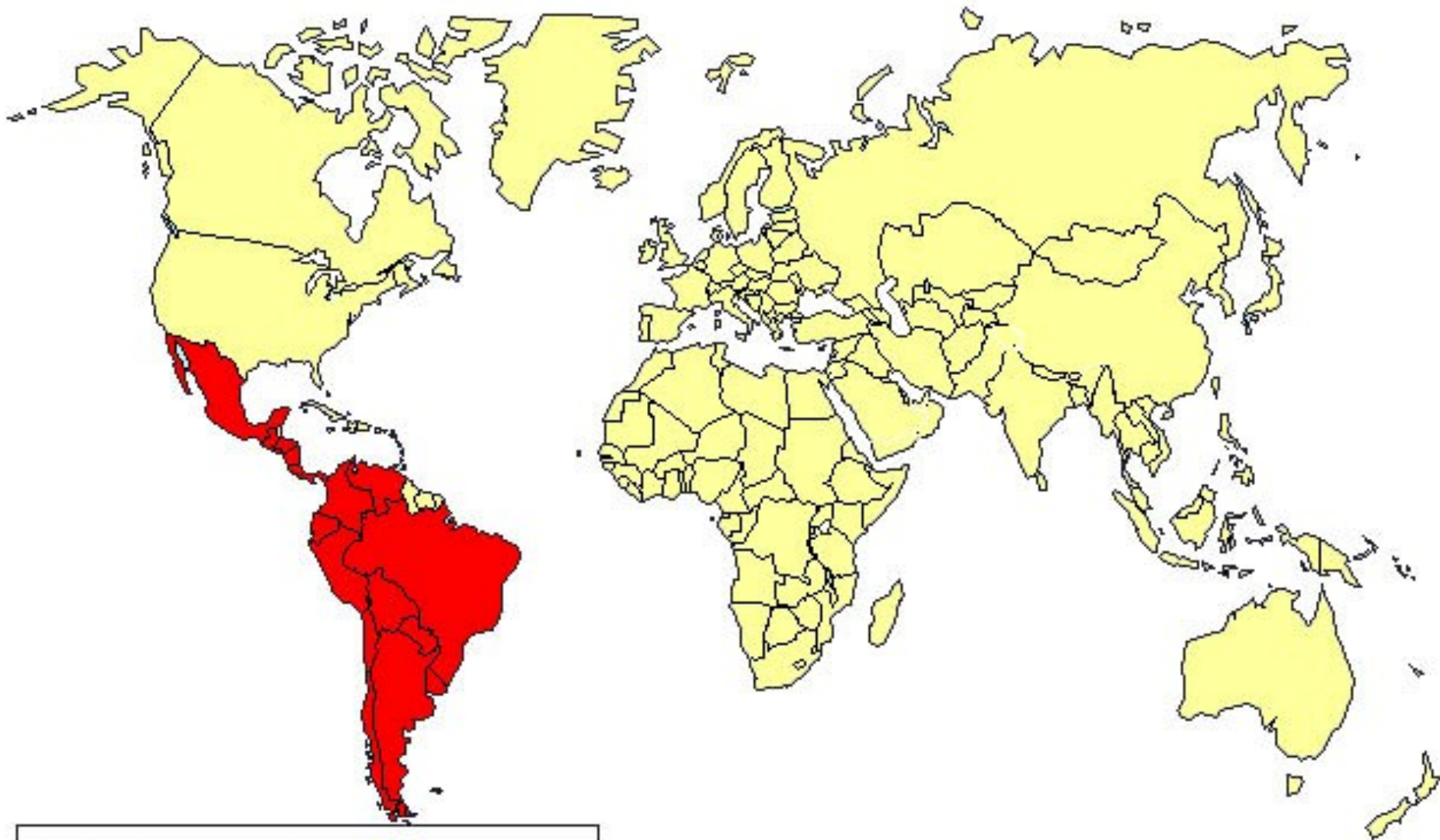
Lymph node aspirate



CSF Lumbar puncture



Chagas Disease



 Chagas Endemic Countries

WHO/CTD, May 1996



Mexico

ATLANTIC OCEAN

Belize

Honduras

Nicaragua

Guatemala

El Salvador

Costa Rica

Panama

Venezuela

Guyana

Suriname

French Guiana

Colombia

Ecuador

Peru

Brazil

Bolivia

Paraguay

PACIFIC OCEAN

Chile

Argentina

Uruguay

Endemic zones of Chagas 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



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 when free in blood stream in form (trypomastigote), but in the tissue it become in form of (**Amastigote**).

American trypanosomiasis (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 or where the bug feces were deposited or accidentally rubbed into the eye.



||| *T. cruzi* causes cutaneous stage
(chagoma)



Ocular lesion (Romana's sign)



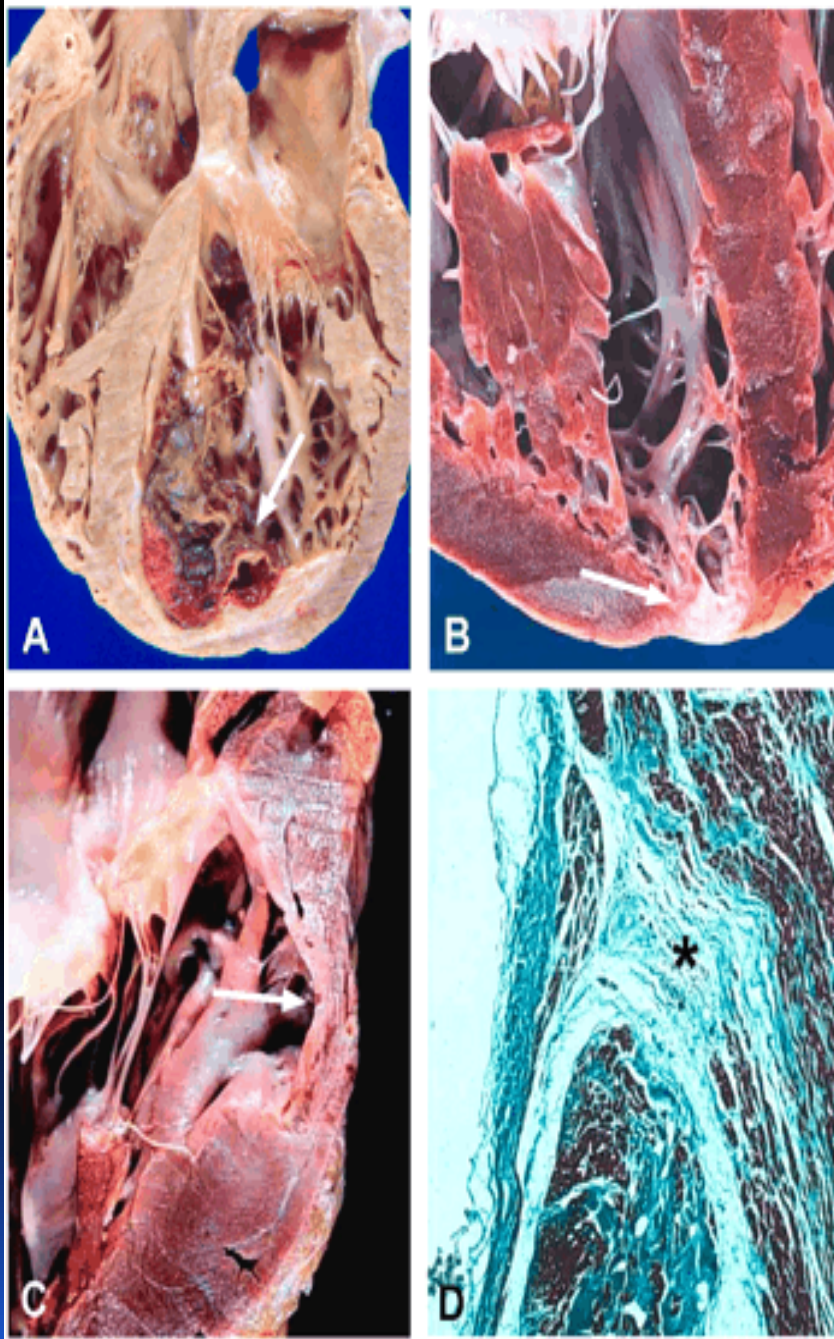
American trypanosomes (Chaga's disease)



- *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 megaintestine and heart aneurysms, If left untreated, Chagas disease can be fatal, in most cases due to heart muscle damage.

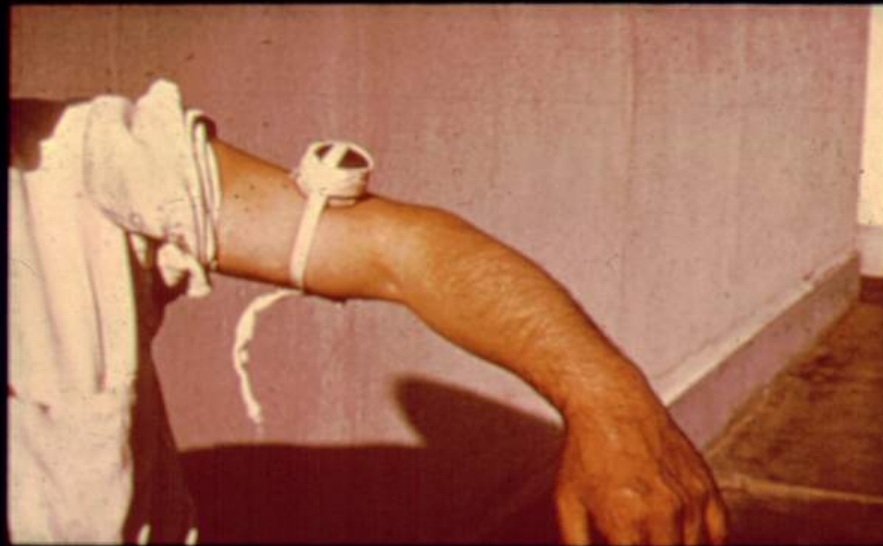
Heart damage due to American trypanosomiasis

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.

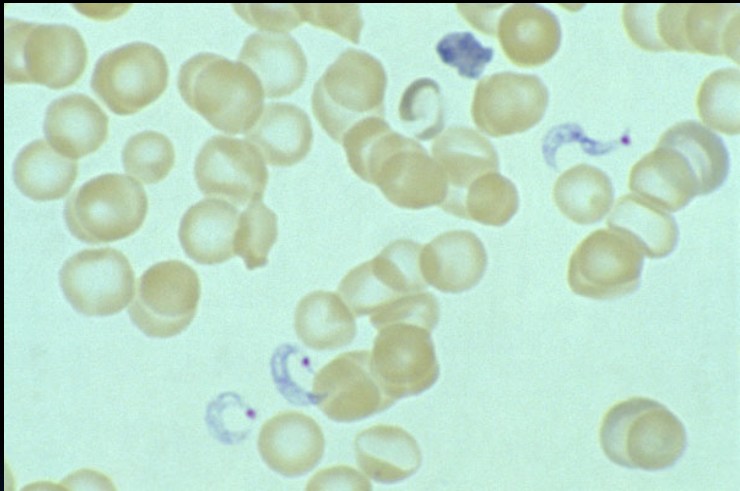


Diagnosis

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



C-shape



TREATMENT OF TRYPANOSOMIASIS

African trypanosomiasis

For early infection

- pentamidine
- suramin

For late infection

- Diflouromethylornithine- (DFMO)

American trypanosomiasis (Chaga's disease)

- benznidazole
- Nifurtimox