



# **Microbiology**

**Subject :**

**Lec no :** 20

**Done By :** Tabark Aldaboubi

وَقُلْ رَبِّ زِدْنِي عِلْمًا

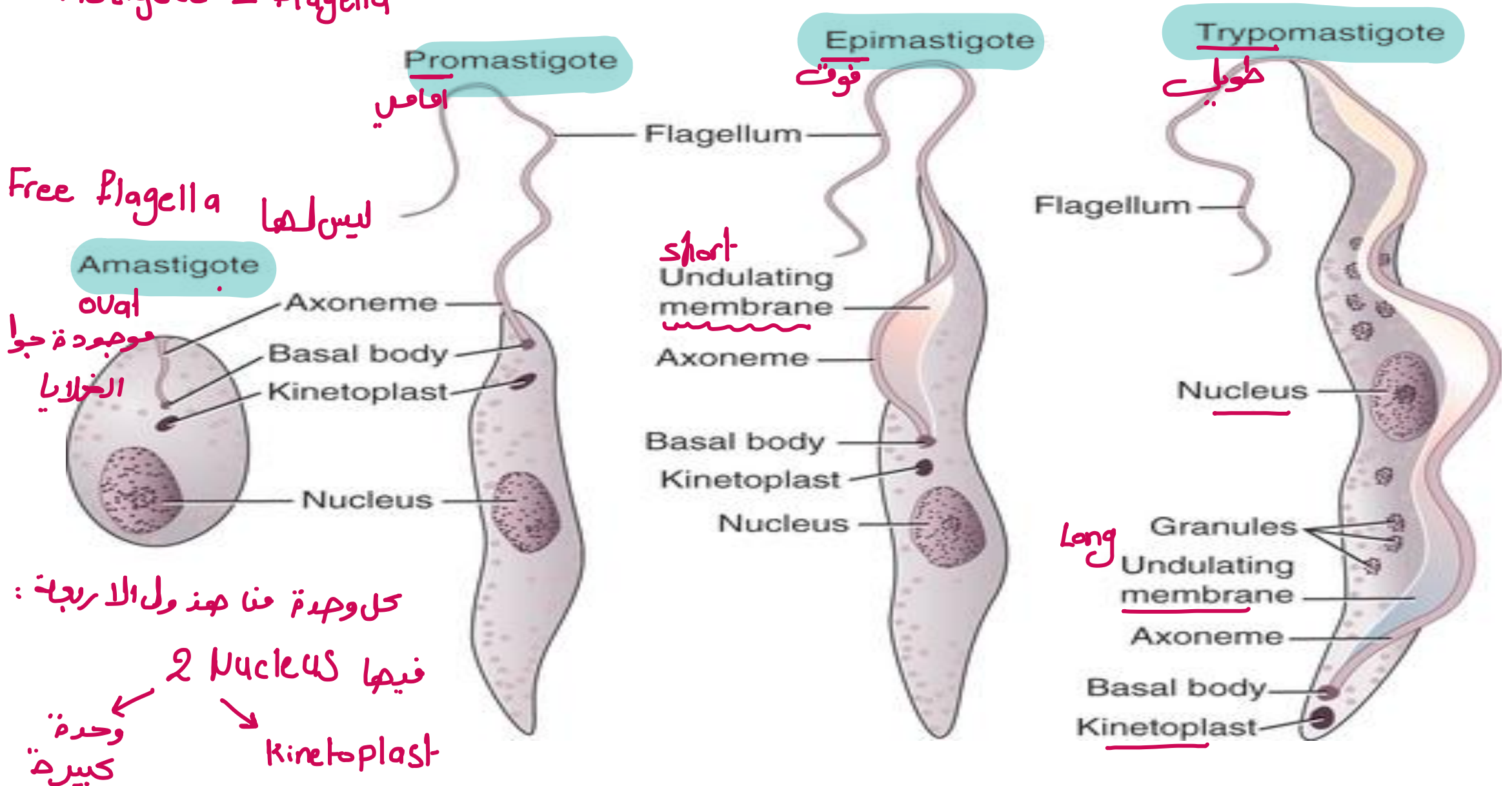
# Hemoflagellates

By Prof. Hala Tabl



# Morphological stages of hemoflagellates

mastigote = flagella



كل وحدة منا هذا الاربعة :  
 فيها 2 Nucleus  
 ← وحدة كبيرة  
 ← Kinetoplast

## **Amastigote:**

oval

جوا الخليا

- Spherical or ovoid, Exclusive **Intracellular**.
- Has 2 nuclei, a large nucleus and kinetoplast.
- No** free flagellum.
- Found in **man**.

## **Promastigote:**

- Spindle-shaped.
- Has 2 nuclei, a large nucleus and **very anterior** kinetoplast & basal body (bb).
- A **free** flagellum.
- Found in **vector**.

## Epimastigote:

- Spindle-shaped.
- Large nucleus and an anterior kinetoplast & bb just in front of the nucleus.
- Has **short** undulating membrane with a **free** flagellum.
- It occurs in the vector.

## Trypomastigote:

- Long and slender.
- Large nucleus and posterior kinetoplast & bb.
- Has long undulating membrane with a **free** flagellum.
- It occurs in **blood** of man and the vector saliva.

# Hemoflagellates

# 1

# Leishmania

## Visceral leishmaniasis:

-*L. donovani* بتسببها parasite اسمها

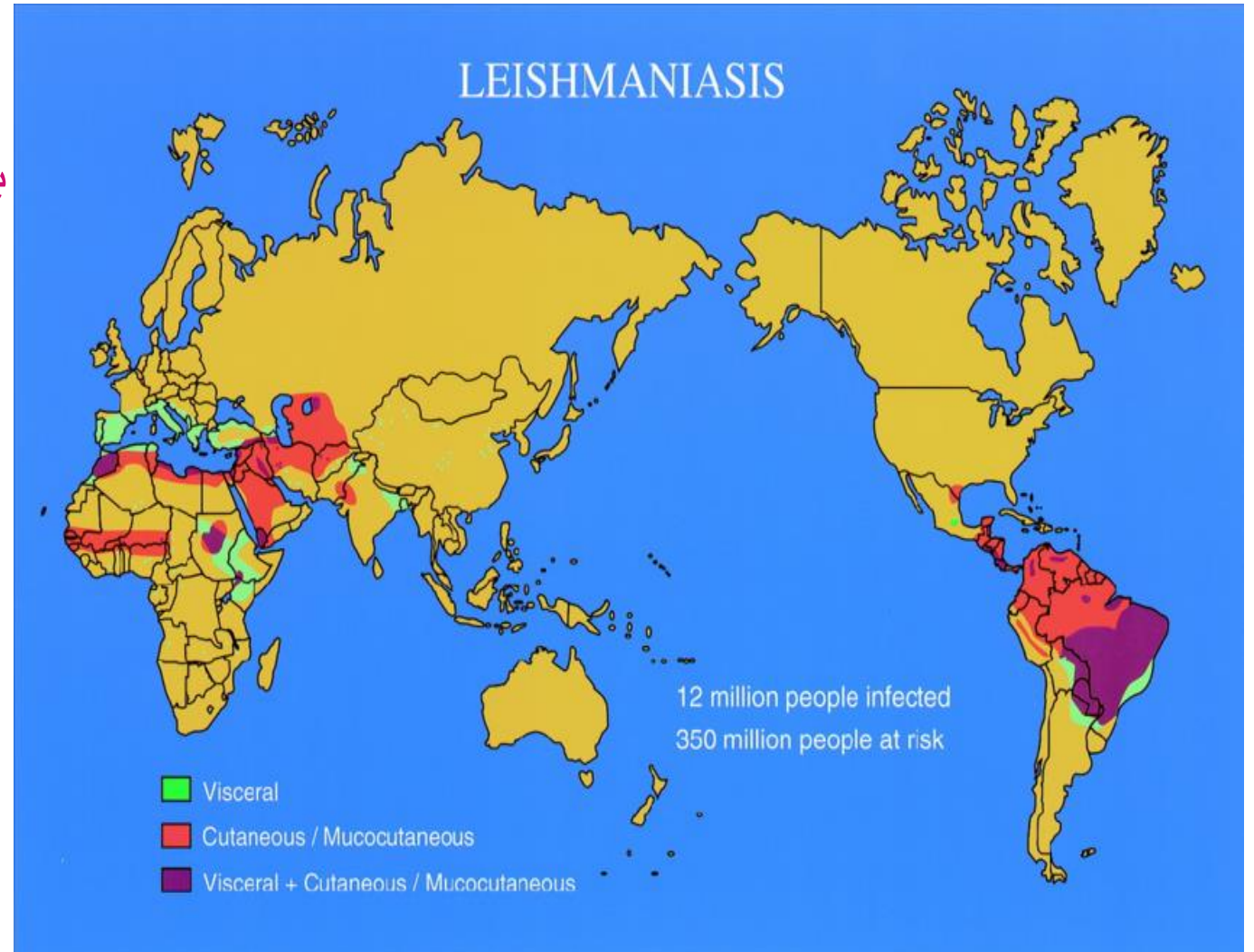
## Cutaneous leishmaniasis:

Affect the skin

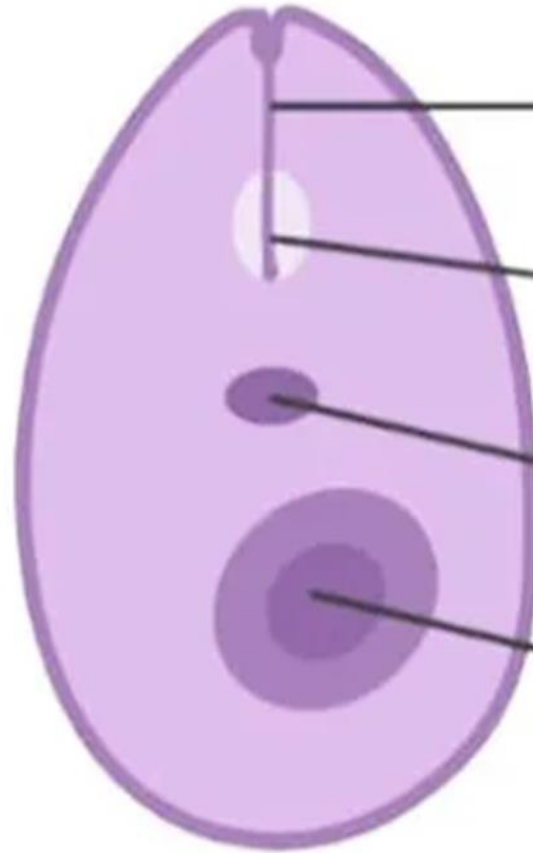
-*L. tropica*

-*L. mexicana*

-*L. braziliensis*



## Leishmania organisms exist in 2 stages



Amastigote stage

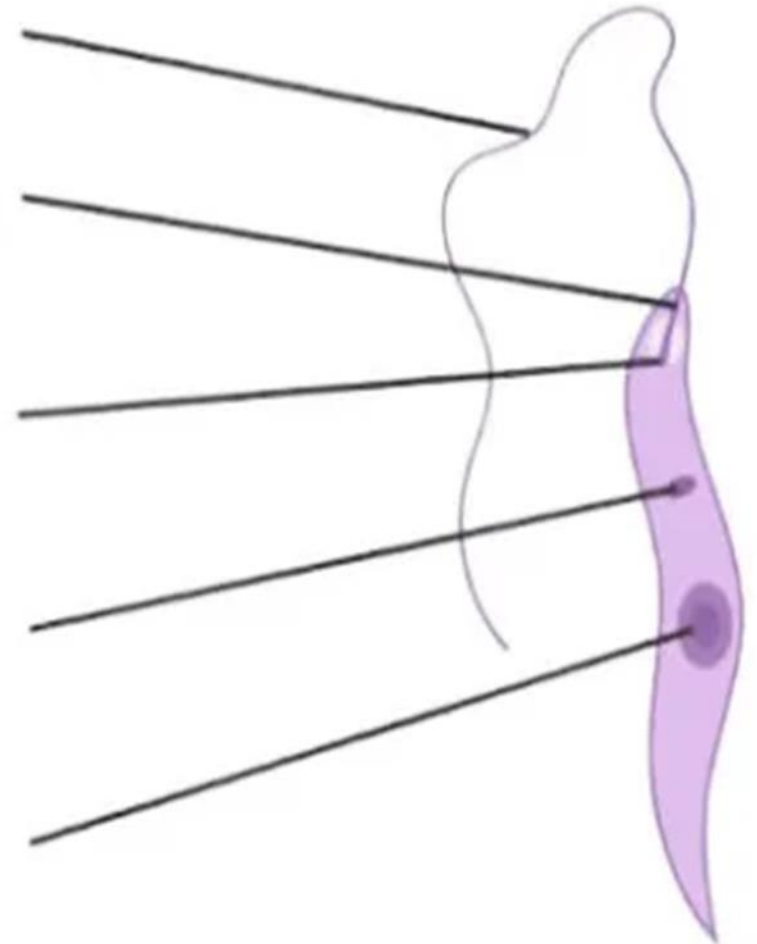
Flagellum

Axoneme

Basal Body

Kinetoplast

Nucleus



Promastigote stage

# Life cycle

**Definitive host:** Man.

**Habitat:** Reticuloendothelial cells (REC)

Liver, spleen, bone marrow lymph node

**Vector:** Female Sand fly.

**Infective stage:** Promastigote.

**Mode of infection:**

-Bite of an infected female sandfly.

-Vertically from mother to fetus.

-Blood transfusion.

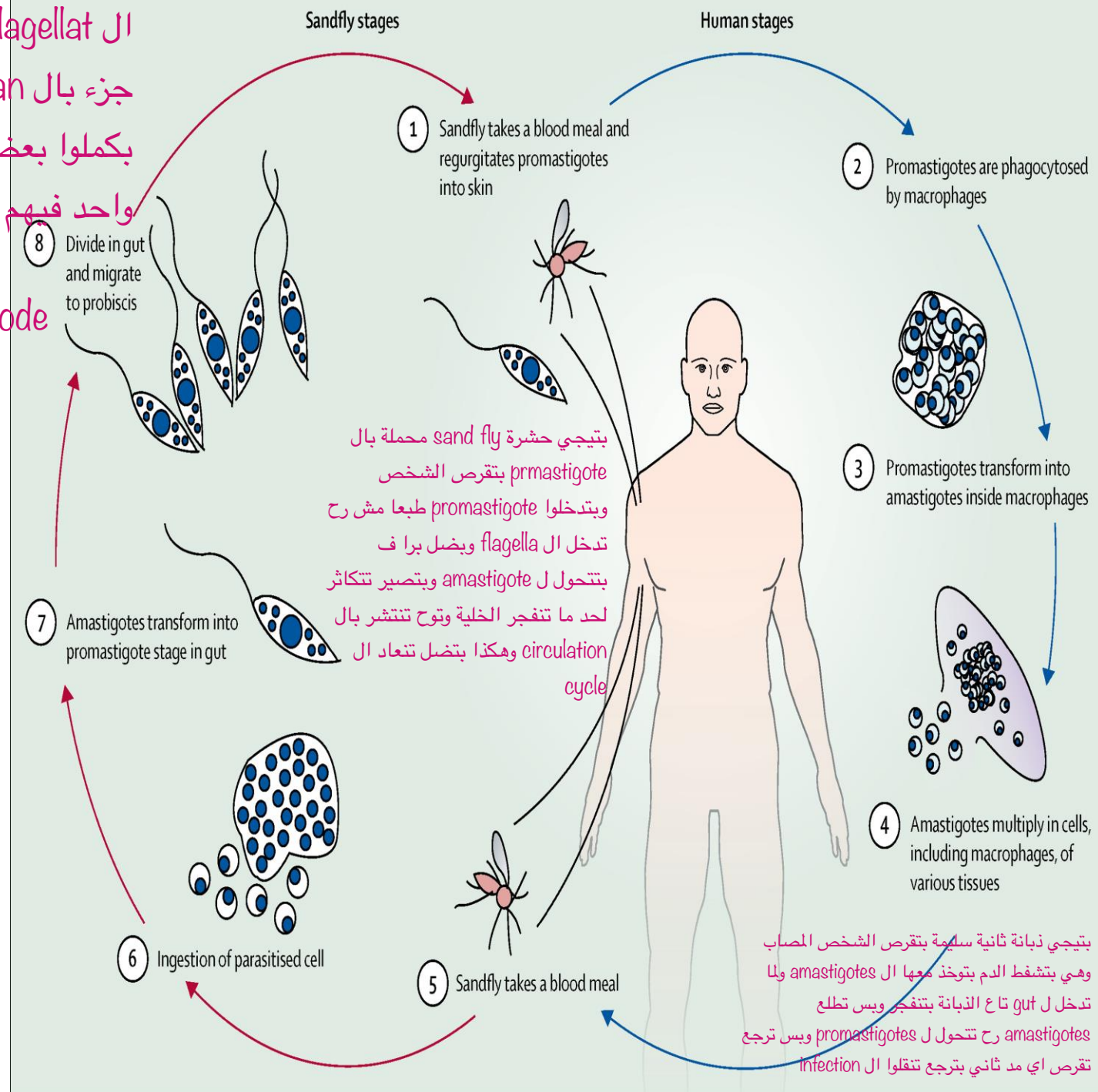
**Diagnostic stage:** Amastigote.

ال hemoflagellat دورة حياتها بتكون معقدة

جزء بال human وجزء بالحشرة وال 2stages

بكملاوا بعض يعني لازم انسان وحشرة اي

واحد فيهم بختفي بتوقف ال cycle





# Leishmania $\xrightarrow[\text{مرض}]{\text{بتعلق}}$ Leishmaniasis

Results from the invasion of RES by amastigotes which multiply enormously in the macrophages. This leads to a marked destruction and proliferation of reticuloendothelial tissue. It may be:

- ① **Visceral leishmaniasis (kala-azar) (black fever):** حمى سوداوى  
حشوية  
بقع
- Persistent fever (Azar) and hyperpigmentation of skin (Kala).
  - Hepatomegaly, splenomegaly and generalized lymphadenopathy.
  - Pancytopenia (Anaemia, repeated infections, intestinal hemorrhage).



- ② **Cutaneous leishmaniasis:** ال RBC بتناثر  
ال RBC بتناثر
- Single or multiple papules that ulcerate.
  - The ulcers healed leaving scars or secondary infected.
- ③ **Mucocutaneous leishmaniasis:-** Rare, affect nasopharynx.



# 2

## Trypanosomes

Trypanosomes are divided into two main groups:

### ①- *Trypanosoma brucei* (African trypanosomes):

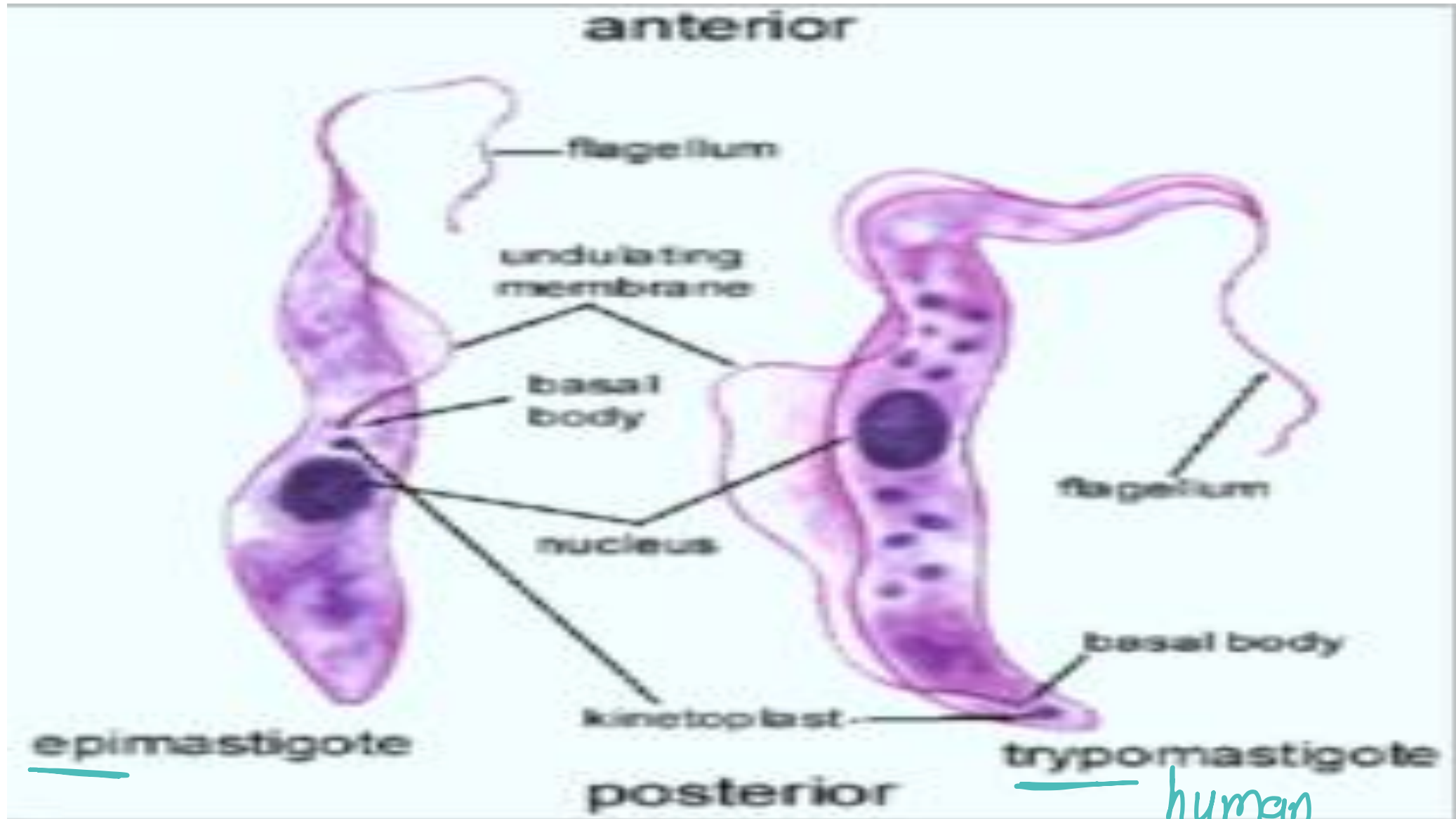
وسط

- Found in Central Africa.
- Transmitted by *Glossina* fly (tsetse fly).
- Causing sleeping sickness. ← بتسبب مرضه

### ②- *Trypanosoma cruzi* (America trypanosomes):

- Found in South and Central America.
- Transmitted by winged bugs.
- Causing Chaga's disease.

# *Trypanosoma brucei*



# Life cycle

جزء بالحشرة وجزء بالانسان عنا tsetse fly (infected) فيها trypomastigote بتيجي بتقرص الشخص السليم وينقلوا اياها (بتضل بالدم ما بتدخل الخلايا) بتضل تتكاثر هناك وبتروح ل tissue معينة ، بعدين بتيجي حشرة ثانية سليمة بتقرص هذا الشخص ويتوخذ ال epimastigote وبتتحول ل trypomastigote

**Definitive host:** Man.

**Habitat:** All tissues specially REC  
(Reticuloendothelial cells)  
and CNS.

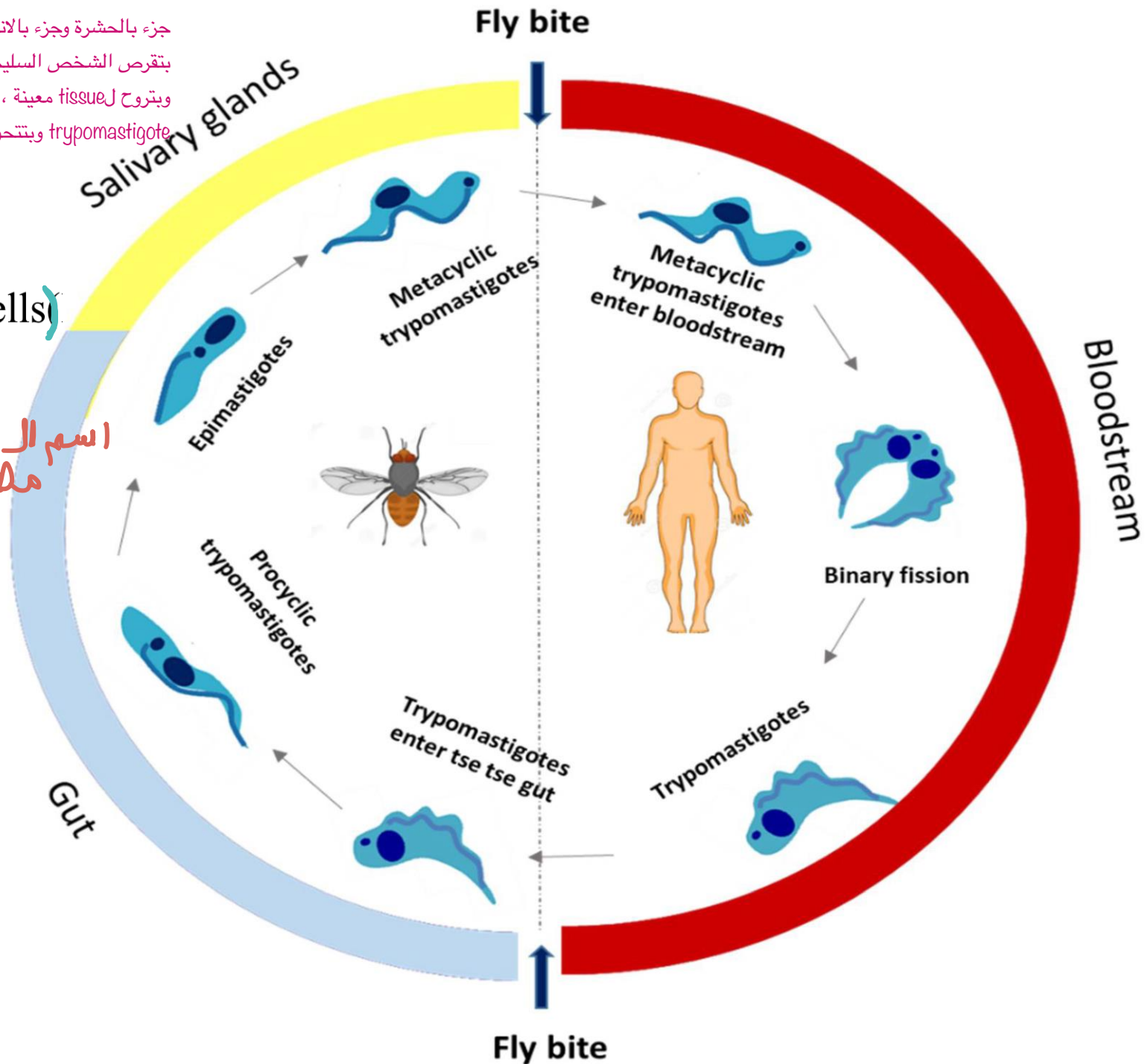
**Vector:** *Glossina* (tsetse fly). *اسم ال ملكم*

**Infective stage:** Trypomastigote.

**Mode of infection:**

- 1) Bite of tsetse fly.
- 2) Congenital infection (rare).
- 3) Blood transfusion.

**Diagnostic stage:** Trypomastigote.



*Trypanosoma brucei* <sup>بتعلی</sup>  
<sub>مرض</sub> → **Sleeping sickness**

**1. Hemo-lymphatic stage:** (parasite invade blood and REC).

-Fever, headache, malaise, anorexia. ← <sup>early stage</sup> بال

-Hepato-splenomegaly, generalized lymphadenopathy and pancytopenia.

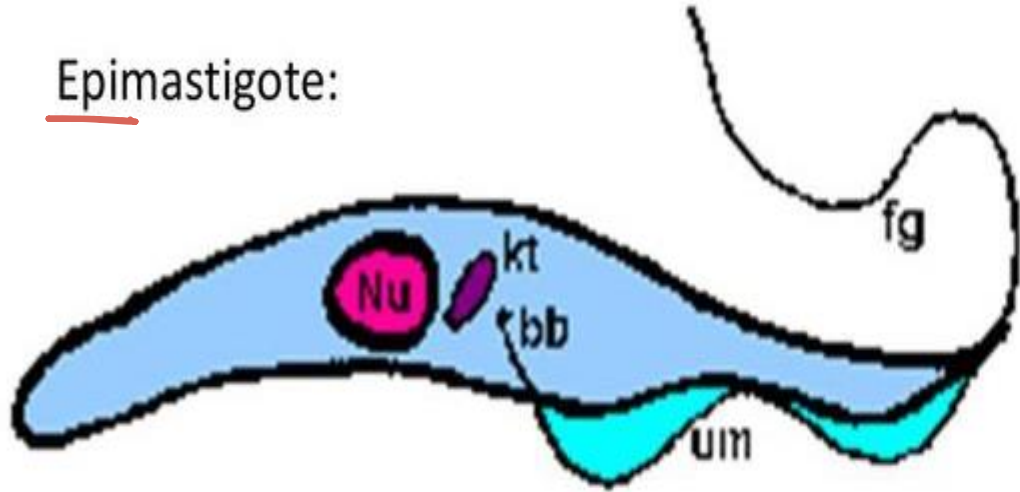
**2. Meningo-encephalitic stage:** (parasite invade CNS). <sup>بعد شهور</sup> <sup>او سنين</sup> late stage

-There is steady progressive apathy, confusion, personality changes and loss of coordination. <sup>ردود افعال غريبة</sup>

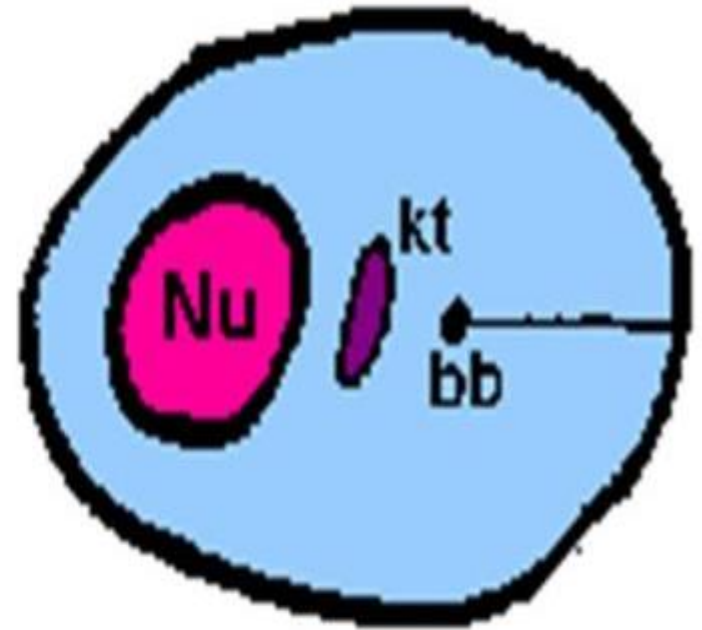
-In terminal phase, the patient becomes emaciated, progressing to coma and death. <sup>هناك</sup> <sup>سبب فقرات النوم الطويلة</sup> →

# *Trypanosoma cruzi*

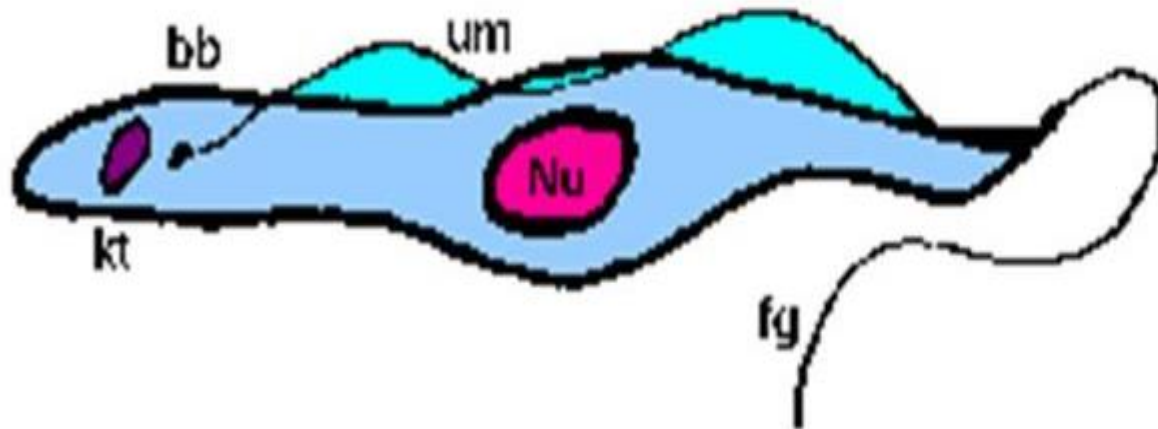
Epimastigote:



Amastigote:



Trypomastigote:





*Trypanosoma cruzi*  $\xrightarrow[\text{درضف}]{\text{تجدد}}$  **Chaga's disease**

-The infection can affect any organ, but the organism has a predilection for REC, "myocardium & conducting system", and CNS. ← بالدكثر

-**Chagoma**: an inflammatory nodule at the bite site of the vector. ↑ مكان القرصة

-**Romana's sign**: periorbital soft tissue swelling which بتسور العين occurs when the organism enters through the conjunctiva.



-There is anemia, hepato-splenomegaly, lymphadenopathy.

-Myocarditis, cardiomyopathy, ventricular aneurysm, arrhythmia and heart block.

(heart failure) بتقل

-Meningo-encephalitis.

\* بتبلش تظهر هاي الاعراض بعد سنين



فانبيها حركة

No  
motility

PHYLUM

**SPOROZOA**

*Microsporidien*



# Sporozoa

- Intracellular. داخل الخلايا
- Complex life cycle (more than one host), asexual reproduction occurs in one host and sexual reproduction in another host.
- **Medically important sporozoa:**

## - Intestinal sporozoa:

Cryptosporidium

Cyclospora

Isospora

## - Tissue sorozoa:

Toxoplasma

Plasmodium

- Tissue sorozoa:

1

# Plasmodium

. (Malariae)

The genus plasmodium contains 4 human species: -

- ①- *Plasmodium malariae* (The mildest type).
- ②- *Plasmodium vivax*.
- ③- *Plasmodium ovale*.
- ④- *Plasmodium falciparum* (The most dangerous type).

The causative agent of malaria, a life-threatening disease distributed in hot moist tropical and subtropical areas.



# Life cycle

**Habitat:** Red Blood Cells (Early after infection the Plasmodium inhabits the liver cells for a certain time).

**Vector:** Females of *Anopheles* mosquitoes (definitive host).

لذات هي المي  
صار فيها ال  
Sexual

**Intermediate host:** Humans → Asexual صافيه

**Infective stage:** Sporozoites in the saliva of infected female mosquitoes.

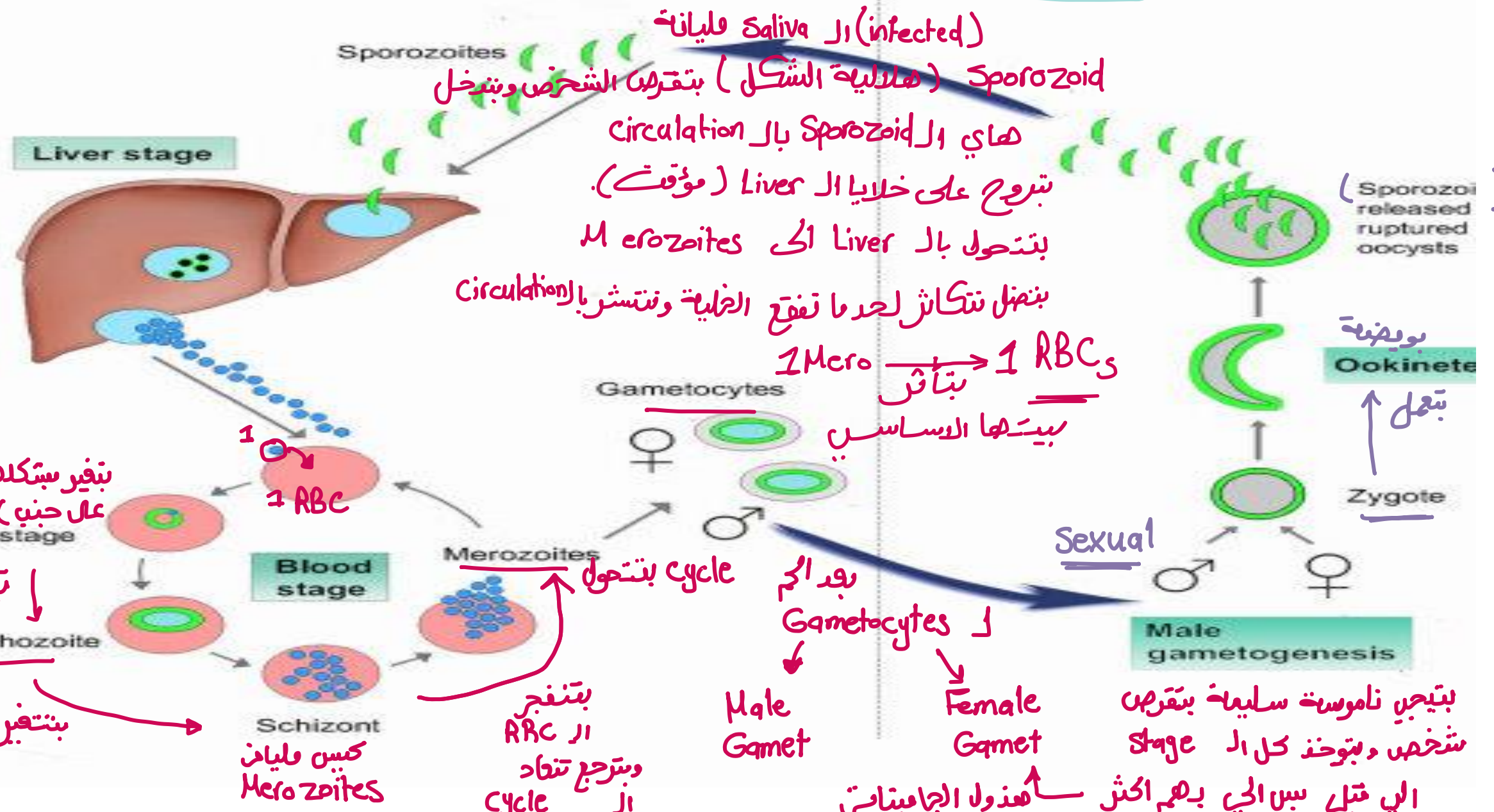
## Mode of infection:

- Bite of Females of *Anopheles* mosquitoes.
- Blood transfusion.
- Transplacental transmission (congenital malaria).

**Diagnostic stages:** All stages (Ring, trophozoites, schizonts and gametocytes).

Host

Vector



(infected) or Saliva of fly

Sporozoid (cellular form) by which the mosquito is infected

They are Sporozoid by circulation

They reach liver cells (temporarily)

They turn into Merozoites

They multiply and spread in circulation

1 Merozoite → 1 RBC

They are the basic

(Sporozoite released ruptured oocysts)

Ookinete

It works

Zygote

Sexual

Male gametogenesis

After the blood meal

Male Gamet

Female Gamet

It produces a motile salivary stage of the mosquito and is taken up by the next host

It is taken up by the next host

It changes its shape (chromatin) (on the side) 1

It changes to

It changes to

cycle by which

It bursts RBC and returns to the cycle

## Pathogenesis & Clinical findings:

<sup>early</sup>  
A) Prodroma: Fever, Anorexia, Headache, Myalgia and Malaise (FAHMM), (for 1 to 2 days.)  
infection بتھیر بائی

B) Fever: Characterized by regular paroxysmal febrile attacks.

➤ Typical malarial febrile attack consists of:  
لے بتتکر عاکی فترات منتظمة

1) Cold stage (half to one hour): Sensation of intense cold, shivering with fever.

2) Hot stage (2-4 hours): fever, up to  $41^{\circ}\text{C}$  with hot dry skin.

3) Sweating stage (2-4 hours): Profuse sweating & temperature falls.

➤ Malarial paroxysmal attacks recur at the following intervals:

a) *P. vivax* and *P. ovale* attack occurs every 48 hs (**tertian malaria**).

اليوم الثالث

b) *P. malariae* attack occurs every 72 hs (**quartan malaria**).

يتكرر كل:

اليوم الرابع

c) *P. falciparum* attack occurs from 24 -48 hs (**Subtertian or irregular malaria**).

الاخطر

يوم ونصف

ممكن ما تكون لها  
موعد وحدود



➤ Between paroxysms, the patient may be tired but otherwise feel fairly good.

➤ Pathogenesis of malarial paroxysm is based on regular erythrocytic cycles that end in schizont rupture → liberation of metabolites, toxins and the formation of malarial pigment.

C) Hemolytic anemia & jaundice (Hemolysis and destruction of R.B.Cs)

D) Hepato-splenomegaly.

E) **Malignant malaria** (*P. falciparum*) is severe and fatal:

(blood vessels become plugged by masses of parasitized red cells →  
بتكون عاكسها بروتانت ←

ischemia & haemorrhage in different organs). Characterized by:

- **Cerebral Malaria:** Meningo-encephalitis.
- **Gastrointestinal syndromes:** Dysentery.
- **Pulmonary edema.**
- **Black water fever (Malarial haemoglobinuria):** acute renal failure.



# 2 *Toxoplasma gondii*

داء القطر

## Morphology

- **Tachyzoite:** It is crescent-shaped, rapidly multiplying  
سريعة. طفيلية الشكل

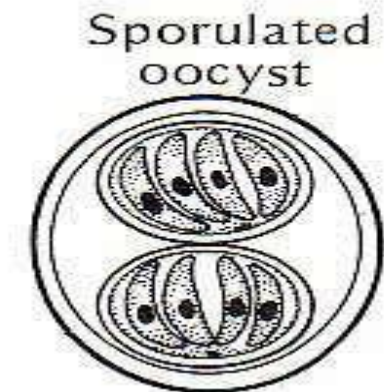
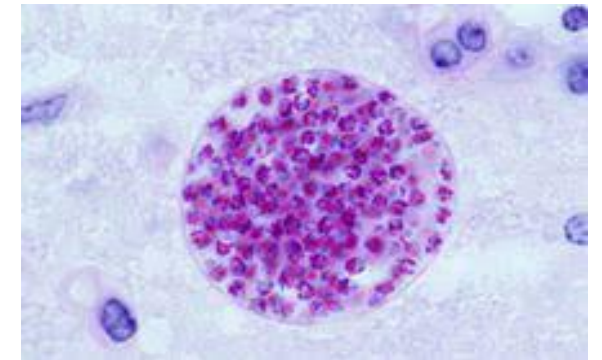
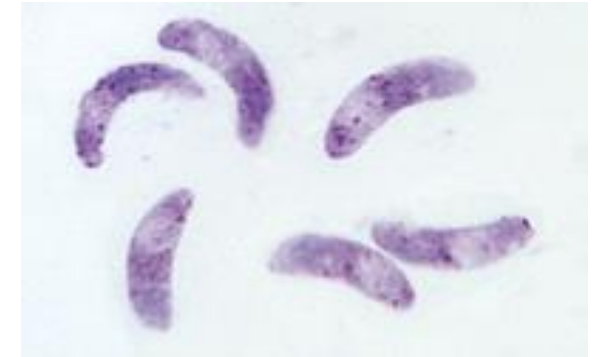
parasite stage .

- **Bradyzoite (tissue cyst):** This is accumulation of slowly  
بطيئة

multiplying parasite stage.

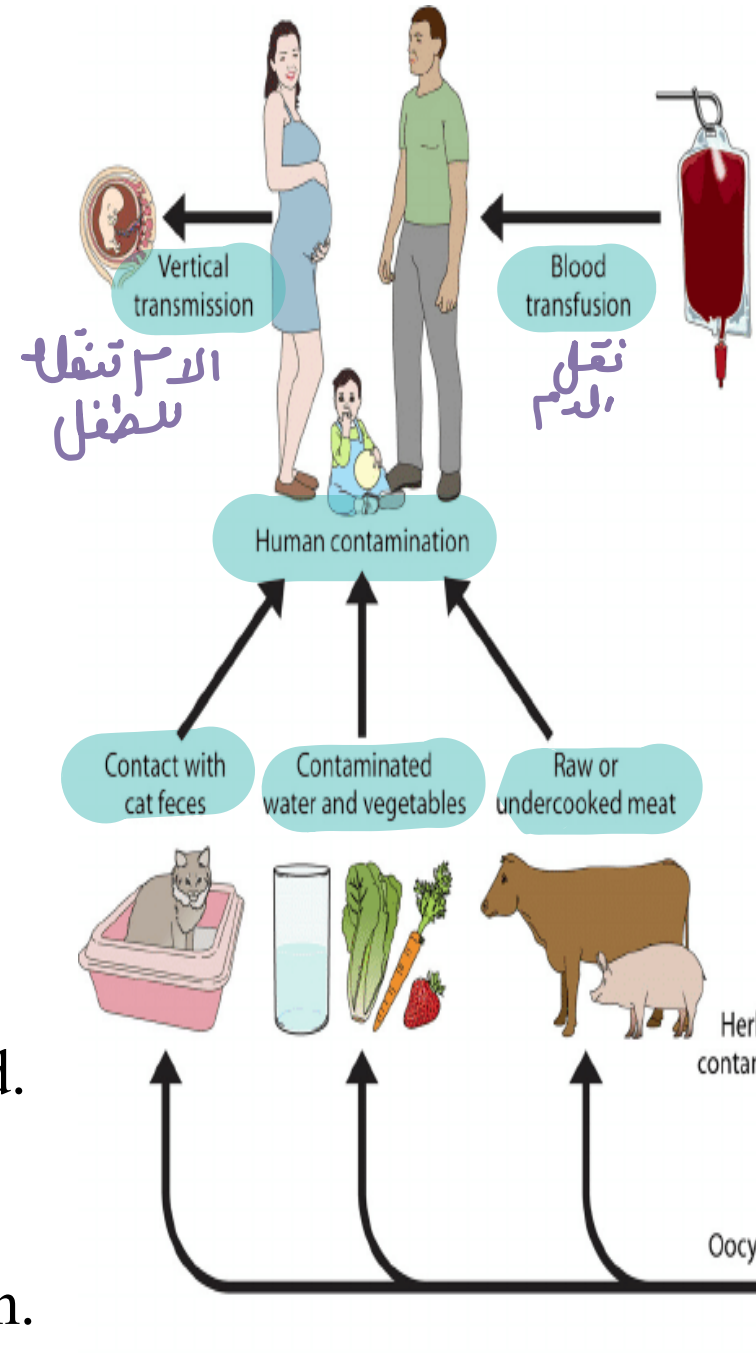
- **Oocyst:** It is oval, 2 sporocysts each contain 4  
بويضات (sexual reproduction)

sporozoites. It is formed only in **cats (definitive host)**.



# Life cycle:

- **Habitat:** Intestinal mucosa of cats.
- **Definitive host:** **Cat is the specific host.**
- **Intermediate host:** Man, mammals.
- **Infective stage:** \*Oocysts in soil.  
 \*Bradyzoites (Tissue cysts) in meat.  
 \*Tachyzoites in blood.
- **Mode of infection:**
  1. Ingestion of tissue cysts in raw meat.
  2. Ingestion of oocysts in contaminated food.
  3. Trans-placental transmission.
  4. Blood transfusion or organ transplantation.



البسة بتصير infected بسبب التقاط فريستها الي هي بالاعلأ  
 الفار لما البسة توكل الفار رح تدخل ال bradyzoite لامعاء البسة  
 ورح تتحرر ال sporozoites وجزء منها يكون male gamete وجزء  
 female ويعطوا zygot ويتعطي Oocyst الي رح ينزل ب stool تا  
 البسة بنعدي منه intermediate host حيوانات المزارع ، الانسان،  
 الفيران بتدخل ال Oocyte وبتتحول ل brady ل بتتحرك بال  
 circulation يتكون سريعة بالاول وبعدين لما جهاز المناعة  
 ينتبه الها واستجابة الها بتعمل رد فعل وبتتخبي وتصير بطيئة  
 بالتكاثر ( بتعمل مييت )

الام تنقل  
 للطفل

نقل  
 الدم

## Pathogenesis & Clinical findings:

مصدر البسات

Toxoplasmosis is a **zoonotic** disease, causing chronic (latent) infection which is mostly asymptomatic. It is of highly significance in:

**1- Pregnant women:** cross placenta leading to:

- Still-birth or abortion.
- Congenital infection: Predominate in the CNS leading hydrocephalus, microcephalus, intracranial calcifications, mental retardation, hearing loss.

**2- Immunocompromised patient:**

Encephalitis and retinitis are the most common manifestation.

**QUIZ**

**TIME**



**Which of the followings is NOT a character of Amastigote?**

A) Spherical or ovoid.

B) Has 2 nuclei, a large nucleus and kinetoplast.

C) Has a free flagellum.

D) Exclusive Intracellular form.

E) Found in man.

**A woman, recently returned from Africa, complains of having paroxysmal attacks of chills, fever, and sweating; these attacks recur every 36 hours. Examination of a stained blood specimen reveals ringlike forms within red blood cells. The infecting organism most likely is:**

*A) Plasmodium falciparum.*

*B) Plasmodium vivax.*

*C) Plasmodium malariae.*

*D) Trypanosoma brucei.*

*E) Leishmania donovani.*

**Which of the following statements concerning *Toxoplasma gondii* is INCORRECT:**

- a) It can be transmitted across the placenta to the fetus.
- b) It can be transmitted by ingestion of food contaminated by cat feces.
- c) It can cause encephalitis in immunocompromised patients.
- d) It can cause severe congenital anomalies in fetus.
- e) Human is the definitive host of the disease.

**Which one of the following protozoa primarily infects macrophages?**

*A) Plasmodium vivax.*

*B) Leishmania donovani.*

*C) Entamoeba histolytica.*

*D) Trichomonas vaginalis.*

*E) Giardia lamblia.*



*Thank  
you*



احسان بما تشئت م  
فان الله لا يخذل  
مؤمن به ن

هندروز @HNDROZ

هندروز