



# LECTURE ( 1 )

## BLOOD PARASITES

---

### OBJECTIVES:

No objectives !

Done by: Joharah Almubrad

Reviewed by: Fahed Alotaibi



Very important

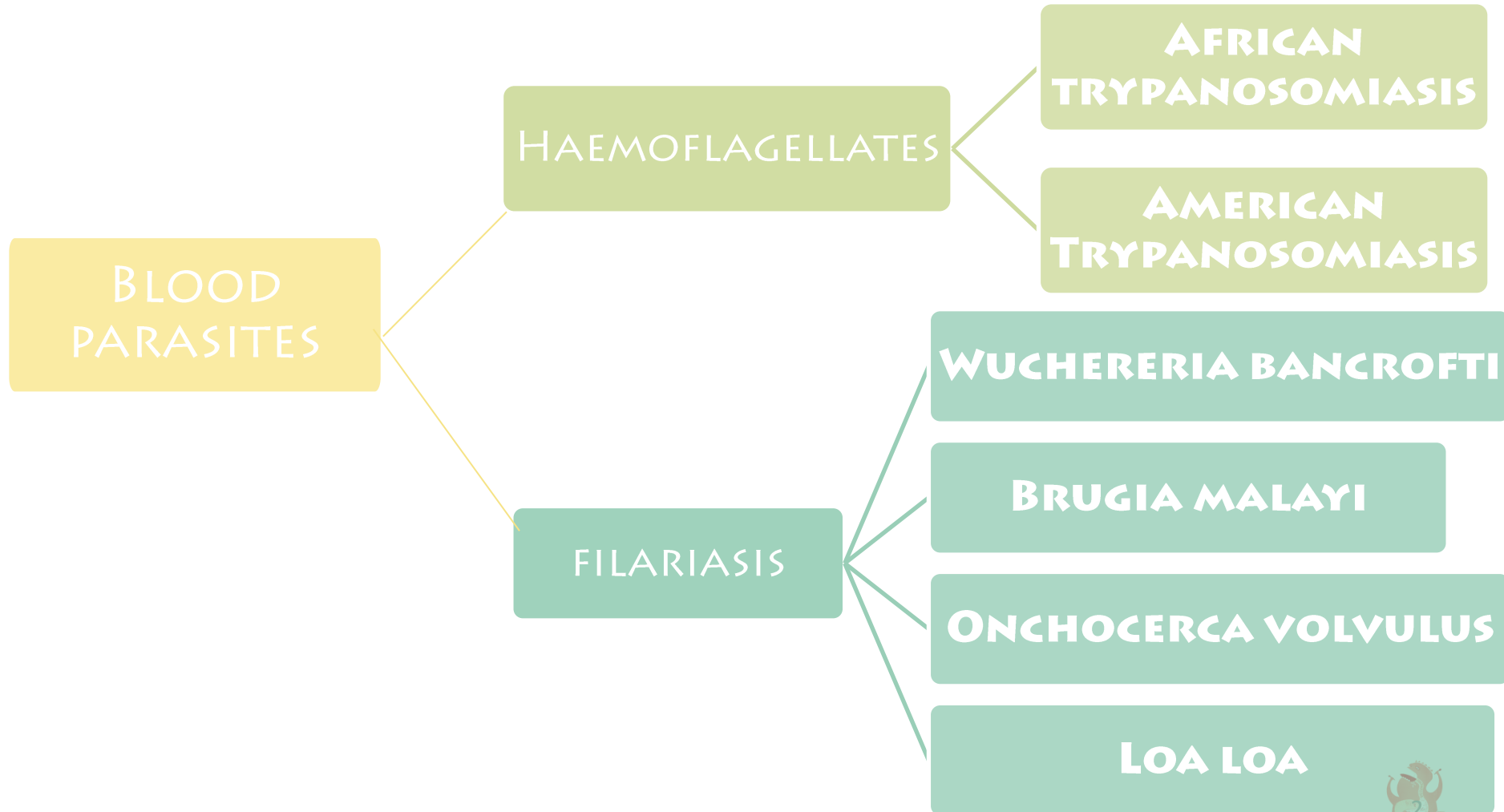
Additional information

Male doctor's notes

Female doctor's notes



# MIND MAP



## HAEMOFLAGELLATES

## AFRICAN SLEEPING SICKNESS "AFRICAN TRYPANOSOMIASIS"

## Protozoa

- Trypanosoma brucei rhodesiense in east Africa
- Trypanosoma brucei gambiense in west and central Africa

## Transmission

By tsetse fly bite

## Morphology

- Trypomostigote is the infective and diagnostic stage.
- In humans trypomostigote found in: blood, lymph nodes and CNS
- Trypomostigote in african sleeping sickness is S shape

## Clinical findings

- 3 stages of the disease:
  1. Skin stage: chancre. "Hard painful skin ulcer at the site of tsetse bite"
  2. Haematolymphatic "winterbottom's stage" stage: generalized lymphadenopathy, anaemia, generalized organ involvement.
  3. Central nervous system stage (CNS): meningoencephalitis.
- **Development of the disease more rapid in trypanosoma brucei rhodesiense**

## Diagnosis

- Visualize trypomostigote in: CSF and lymph node aspirate

## Treatment

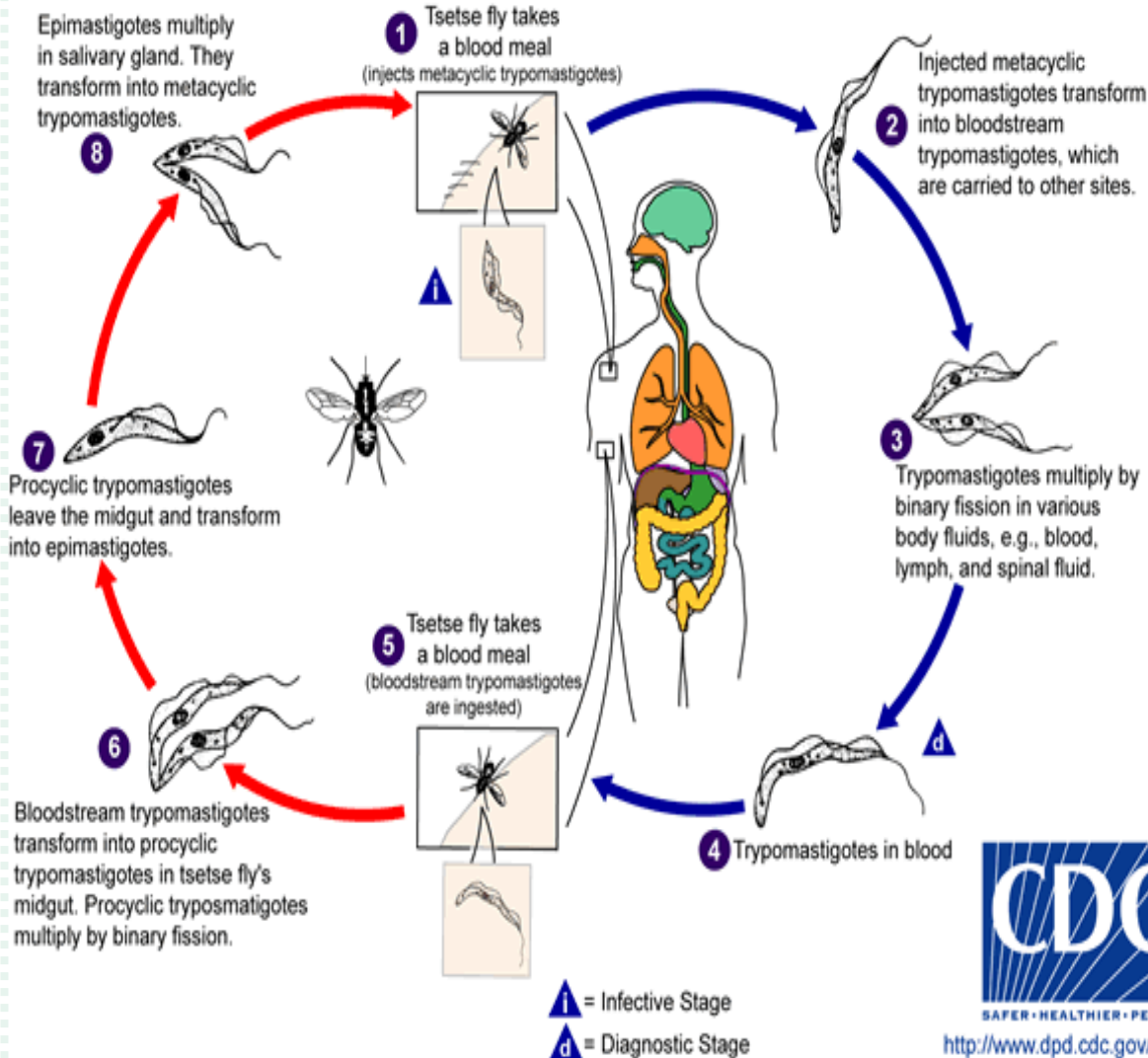
- For early infection: -Pentamidine -Suramin
- For late infection: -Eflornithine (diflouromethylornithine- DFMO)



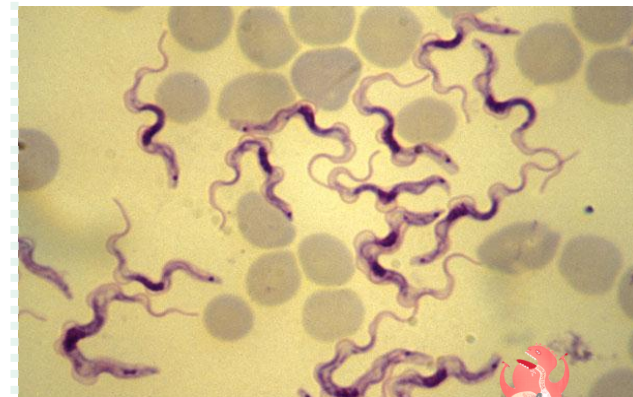
# Life cycle of *Trypanosoma brucei gambiense* & *T. b. rhodesiense*

Tsetse fly Stages

Human Stages



## Trypanosoma



# CHAGAS DISEASE "AMERICAN TRYPANOSOMIASIS"

## Protozoa

T. Cruzi "trypanosome cruzi"

## Transmission

By **Reduviid (triatomine) bug** "vector": defecats on human skin while feeding **trypomastigote** in the feces tunnel into skin

## Morphology

- Trypomastigote is the infective and diagnostic stage.
- Trypomastigote found in humans in: **blood** and **heart**
- Trypomastigote is C shape
- Cutaneous stage (**chagoma**): **hardened red area of skin at the site of parasite entry**
- Ocular lesion (romana' sign) **one eye usually**
- Heart damage "in early manifestation arrhythmias → late stag **heart failure "cardiomyopathy"**
- Blood film
- Serology: IFAT
- Xenodiagnosis: feeding bugs on a suspected cases.
- Benznidazole
- Nifurtimox

## Clinical findings

## Diagnosis

## Treatment

Trypomastigote is  
C shape



## Life Cycle Of Trypanosoma Cruzi

### Triatomine Bug Stages

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

1

### Human Stages

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

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.

5 Triatomine bug takes a blood meal (trypomastigotes ingested)

5

6 Epimastigotes in midgut

6

7 Multiply in midgut

7

8 Metacyclic trypomastigotes in hindgut

8

**i** = Infective Stage

**d** = Diagnostic Stage



SAFER • HEALTHIER • PEOPLE™

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

## Romana' sign



### Chagas Disease



**■** Chagas Endemic Countries



WILSON 1996

# FILARIASIS MAJOR FILARIAL INFECTIONS OF HUMANS

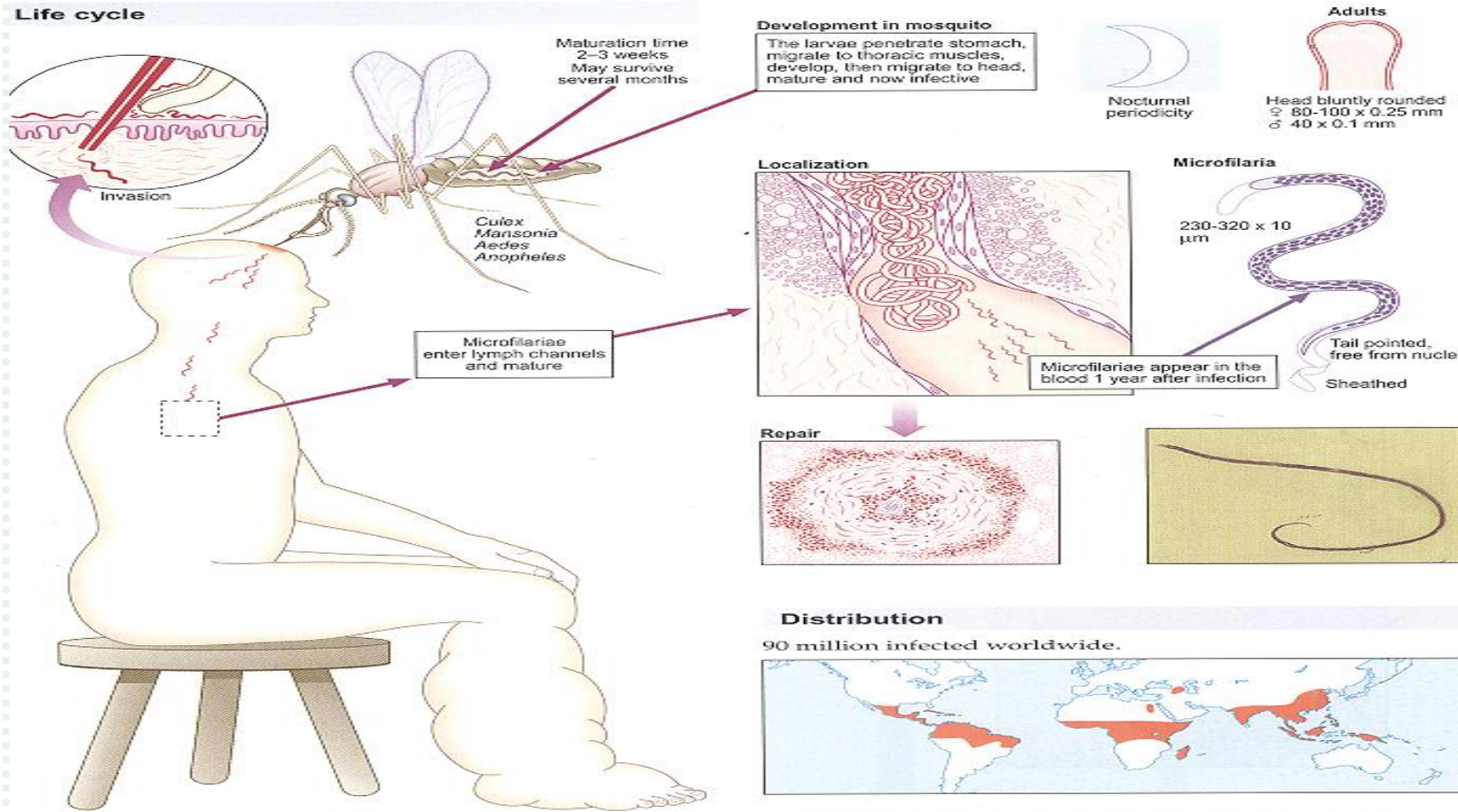
Species	Wuchereria bancrofti	Brugia malayi	Onchocerca volvulus	Loa loa
Disease	elephantiasis		Onchocerciasis( <b>river blindness</b> )	loiasis
Geographic distribution	Tropical and subtropical areas	Asia	Africa, Central and South America, <b>Yemen</b>	Central Africa
Location of adult in humans	<b>Lymphatic vessels</b>		<b>Subcutaneous nodules</b>	Moving in subcutaneous tissues
Microfilaria location	<b>Blood(nocturnal periodicity)</b>		Skin, eyes, no periodicity	Blood(diurnal periodicity)
Vector	Mosquitoes		Simulium spp. ( <b>black fly</b> )	Chrysops spp. ( <b>deer fly</b> )
Pathology	Due to adult worm obstructing lymphatics. <ul style="list-style-type: none"> <li>Acute: lymphadenitis lymphatic varices</li> <li>Chronic: lymphedema, hydrocele, chyluria</li> </ul>		Adults worms live in subcutaneous nodules. Main pathology caused by microfilariae in: <ul style="list-style-type: none"> <li>Skin: dermatitis</li> <li>Lymph nodes: lymphadenopathy</li> <li><b>Eyes: blindness</b></li> </ul>	Adult worm continuously migration in <b>subcutaneous and subconjunctival tissues</b> , causing: <ul style="list-style-type: none"> <li>Calabar swellings (allergic reactions)</li> <li><b>conjunctivitis.</b></li> </ul>
More explanation in next slide				
Lab. Diagnosis	<ul style="list-style-type: none"> <li><b>Blood film</b> “Knott’s method”</li> <li>Immunological tests</li> </ul>		<b>Skin snip</b>	Blood film
Treatment	diethylcarbamazine (DEC) or ivermectin		<b>Ivermectin</b>	diethylcarbamazine(DEC) or ivermectin, <b>surgical removal.</b>



- (nocturnal periodicity): means that few organism circulate during daylight.
- so for diagnosis of elephantiasis → seeing the microfilariae at blood film is best at midnight “10pm to 2am”
- (diurnal periodicity) : means that few organism circulate during night
  - **Chyluria** : a milky appearance of the urine caused by the presence of chyle. due to obstruction between the intestinal lymphatics and the thoracic duct and rupture of renal lymphatics into the renal tubules.
  - lymphatic varices: enlarged lymph nodes

### *Wuchereria bancrofti* (filariasis)

#### Life cycle





*Loa loa*

Fly Stages

1 Fly (genus *Chrysops*) takes a blood meal (L3 larvae enter bite wound)

Human Stages

2 Adults in subcutaneous tissue

3 Adults produce sheathed microfilariae that are found in spinal fluid, urine, sputum, peripheral blood and in the lungs

4 Fly takes a blood meal (ingests microfilariae)

5 Microfilariae shed sheaths, penetrate fly's midgut, and migrate to thoracic muscles

8 Migrate to head and fly's proboscis

7 L3 larvae

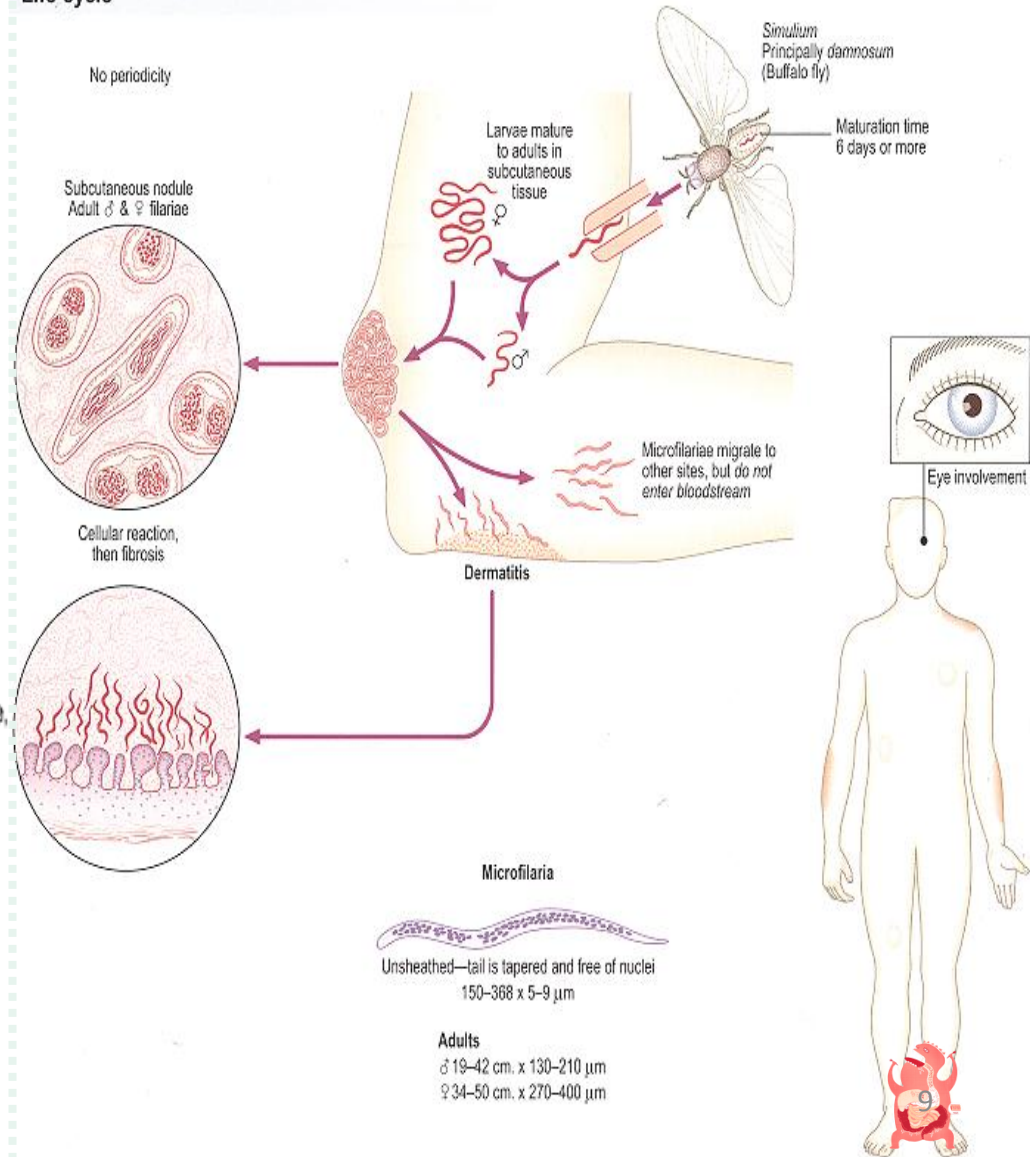
6 L1 larvae

▲ = Infective Stage  
▲<sub>d</sub> = Diagnostic Stage

*Onchocerca volvulus* (blinding worm)

Life cycle

No periodicity





## HAEMOFLAGELLATES

Disease name	African sleeping sickness African trypanosomiasis	American trypanosomiasis chagas disease
Protozoa	Trypanosoma brucei rhodesiense Trypanosoma brucei gambiense	T. Cruzi “trypanosome cruzi”
Transmission	<b>Tsetse fly bite</b>	<b>Reduviid (triatomine) bug</b>
Morphology	infective and diagnostic stage :Trypomostigote Trypomostigote is s shape	infective + diagnostic stage :Trypomostigote Trypomostigote is c shape
Clinical findings	3 stages of the disease: <ol style="list-style-type: none"> <li><b>Skin stage: chancre.</b></li> <li>Haematolymphatic “<b>winterbottom’s</b>”stage: generalized lymphadenopathy, anaemia, generalized organ involvement.</li> <li>Central nervous system stage (cns): meningoencephalitis.</li> </ol> Development of the disease more rapid in trypanosoma brucei rhodesiense	<ul style="list-style-type: none"> <li><b>Cutaneous stage (chagoma)</b></li> <li>Ocular lesion (romana’ sign)</li> <li>heart damage</li> </ul>
Diagnosis	Visualize trypomostigote in: csf and lymph node aspirate	- Blood film      - serology: ifat <b>- Xenodiagnosis</b>
Treatment	For early infection: -pentamidine -suramin For late infection: -eflornithine (diflouromethylornithine- dfmo)	Benznidazole Nifurtimox

## FILARIASIS

- **Wuchereria bancrofti and brugia malayi cause elephantiasis vector is mosquitoes**
  - The main pathology is due adult worm obstructing lymphatics.
  - Acute: lymphadenitis lymphatic varices
  - Chronic: lymphedema, hydrocele, chyluria
  - Diagnosis by: blood film “knott’s method” and immunological tests
  
- **Onchocerca volvulus cause onchocerciasis(river blindness)**  
**Vector is simulium spp. (Black fly)**
  - Main pathology caused by microfilariae in:
    - skin: dermatitis
    - lymph nodes: lymphadenopathy
    - eyes: blindness
  - Diagnosis by: skin snip
  
- **Loa loa cause loiasis the vector is chrysops spp. (Deer fly)**
  - Main pathology caused by adult worm continuously migration in subcutaneous and subconjunctival tissues, causing: -calabar swellings (allergic reactions) -conjunctivitis.
  - Diagnosis by: blood film
  
- **For all the mentioned cases of filariasis treatment is ivermectin**
- **Diethylcarbamazine(DEC) used for treatment of elephantiasis and loiasis**
- **In loiasis we can do surgical removal.**





# QUESTIONS

1. **Trypanosoma brucei rhodesiense** is the causative agent of:

- A. River blindness
- B. African sleeping sickness
- C. Chagas disease
- D. Elephantiasis

2. **Transmission of chagas disease** is by:

- A. Tsetse fly bite
- B. Mosquitoes
- C. Simulium spp. (black fly)
- D. Reduviid (triatomine) bug

3. **In which disease** we will see winterbottom's stage:

- A. Loiasis
- B. American trypanosomiasis
- C. African trypanosomiasis
- D. Elephantiasis

4. **Chagas disease** will cause:

- A. Lymphadenitis
- B. Chancre
- C. Chagoma and heart damage
- D. Conjunctivitis



# QUESTIONS

5. In which disease the vector is deer fly:
- Loiasis
  - Chagas
  - Elephantiasis
  - Onchocerciasis
6. A patient comes with dermatitis, lymphadenopathy and blindness he is suspected to have:
- Loiasis
  - Chagas
  - Elephantiasis
  - Onchocerciasis(River blindness)
7. In the previous case which test will you order to confirm:
- Xenodiagnosis
  - Skin snip
  - Blood film
  - Serology: ifat
8. Elephantiasis is caused by:
- Brugia malayi vector is tsetse fly bite
  - T. Cruzi vector is reduviid bug
  - Wuchereria bancrofti vector is mosquitoes
  - Onchocerca volvulus vector is black fly

Qs	1	2	3	4	5	6	7	8
answer	B	D	C	C	A	D	B	C

**FOR ANY SUGGESTIONS AND PROBLEMS PLEASE CONTACT:**

MICROBIOLOGY TEAM LEADERS  
KHALED ALOSAIMI AND JOHARAH ALMUBRAD  
MICROBIOLOGY432@GMAIL.COM