

Parasitic Infections Affecting CNS and Special senses

CNS	Free living amoeba	- Primary Amoebic Meningoencephalitis - Granulomatous Amoebic Meningoencephalitis
	<i>Trypanosoma brucei</i>	Sleeping Sickness
	<i>Entamoebae histolytica</i>	Secondary Amoebic Cerebral Abscess
	<i>Taenia solium</i>	Neurocysticercosis
Senses	<i>Acanthamoeba castellanii</i>	Keratitis & corneal ulcers
	<i>Taenia solium</i>	Neurocysticercosis
	<i>Onchocerca volvulus</i>	Onchocerciasis

a) *Trypanosoma Brucei* (African Trypanosomiasis) (Sleeping sickness)

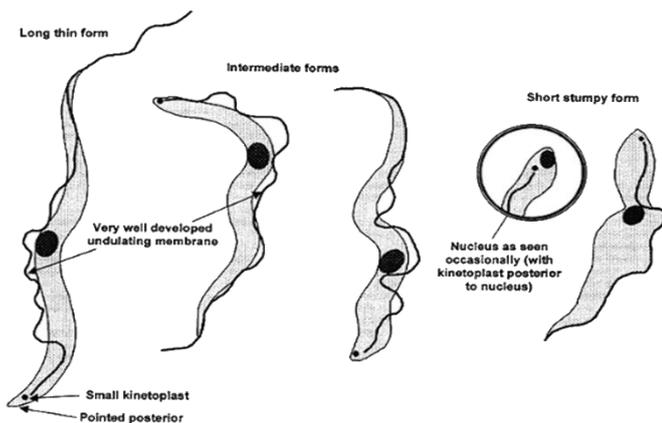
▪ Causative Organism:

<u>Chronic Sleeping sickness</u>	<i>Trypanosoma brucei gambiense</i>
<u>Acute Sleeping sickness</u>	<i>Trypanosoma brucei rhodesiense</i>

▪ Morphology of Trypomastigotes:

- Motile (with anterior flagellum & undulating membrane).
- Forms:

Vertebrate	Long slender form	30 μm – Free flagellum & actively motile
	Intermediate form	22 μm – Short free flagellum
	Short stumpy form	15 μm – Without free flagellum
Vector	Metacyclic trypomastigote	The infective stage , found in salivary glands of the <i>Glossina</i> (Tsetse) fly



▪ Habitat:

Early stage	- Extracellular (peripheral blood). - Spread to RECs (Liver, Spleen, Lymph nodes, Bone marrow).
Late stage	In CNS
Definitive host	Man
Intermediate host	<i>Glossina</i> (Tsetse) fly
Reservoir host	Animals, as antelopes, pigs, goats & dogs

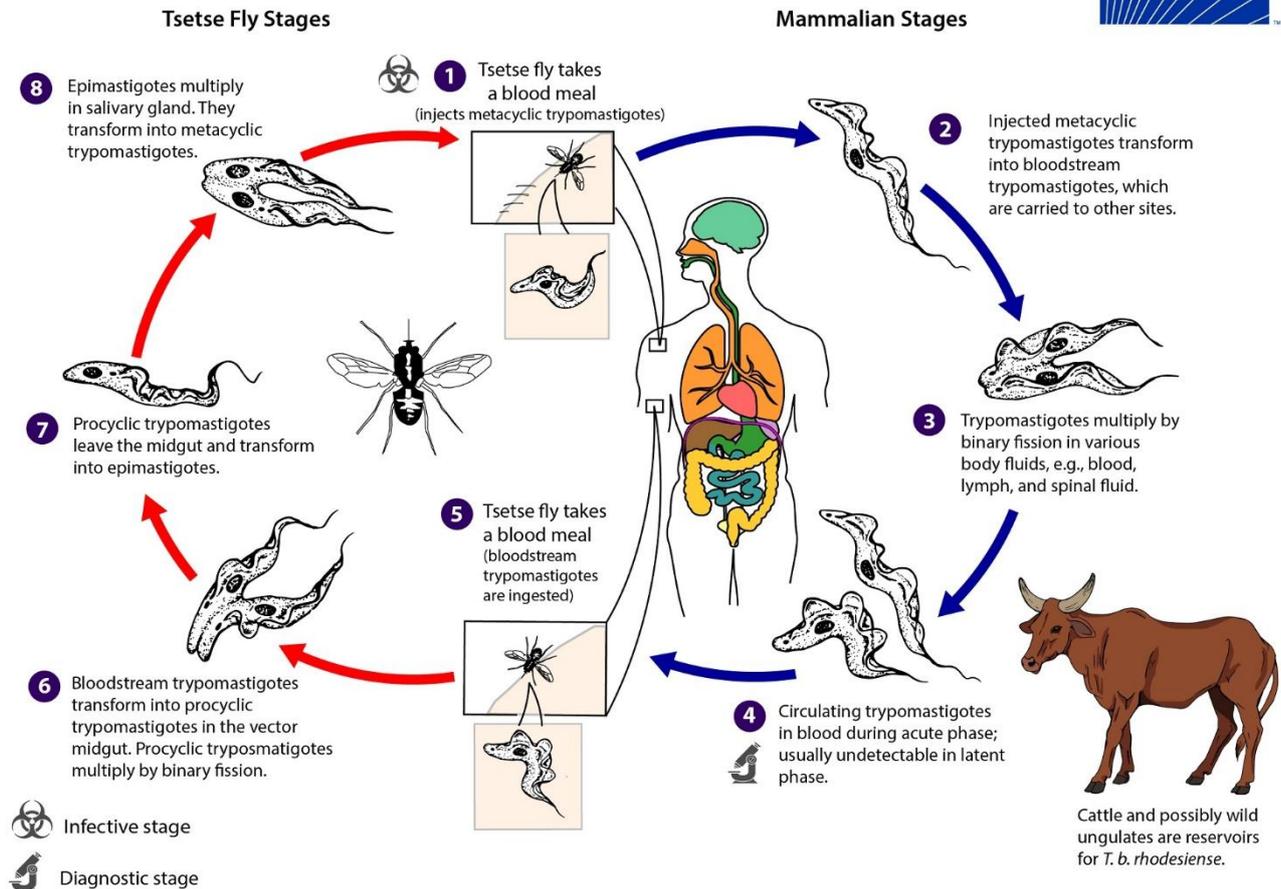
▪ Mode of transmission:

- Bite of fly (infected saliva).
- Blood transfusion.
- Organ transplantation.
- Congenital.

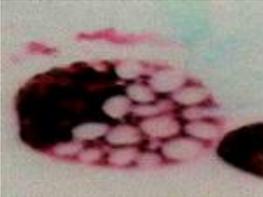


African Trypanosomiasis

Trypanosoma brucei gambiense & *Trypanosoma brucei rhodesiense*



▪ Clinical picture (3 stages):

<p>Trypanosoma chancre [skin]</p>	<ul style="list-style-type: none"> - Trypomastigotes multiply at the site of bite causing a local inflammatory nodule. - Features: <ul style="list-style-type: none"> - Painful, red. - Intense cellular infiltration, oedema. - Divided trypomastigotes 	
<p>Hemo-lymphatic [Blood & Lymph nodes]</p>	<ul style="list-style-type: none"> - Toxic manifestations: <ul style="list-style-type: none"> - Irregular fever, rash & headache - Joint & muscle pain. - Lymphadenopathy <ul style="list-style-type: none"> - Posterior triangle of neck "Winterbottom's sign" - Hepatosplenomegaly. - Bone marrow affection: <ul style="list-style-type: none"> - Anemia - Leukopenia - Thrombocytopenia 	
<p>Meningoencephalitis [CNS] (Sleeping Sickness)</p>	<ul style="list-style-type: none"> - CNS invasion → Inflammatory cells (morula cells of Mott) → ischemia & hemorrhage → neuronal degeneration → Meningoencephalitis. - Patient suffers of: Severe headache, mental apathy, slow speech, tremors, involuntary movements & convulsions. - Sleeping stage → Coma & death [from disease or infections as pneumonia]. 	

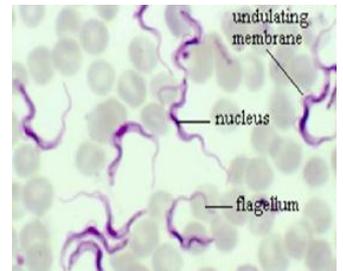
N.B. Acute sleeping sickness:

Clinical features of Rhodesian disease are **similar** to Gambian but they cause severe **fatal** disease in **short duration**. Acute course; patients usually die rapidly.



▪ Diagnosis:

Clinical	History of Residence or traveling to endemic area	
	Clinical picture	
Laboratory diagnosis	Direct Microscopic Examination	<p>- Detection of polymorphic trypomastigotes in blood, aspirates (chancre, lymph node, bone marrow), or CSF (lumbar puncture).</p> <p>- CSF examination: Trypomastigotes & Morula cells of Mott.</p>
	Culture	NNN media
	Animal inoculation	-
	Antibodies or Antigen detection	By ELISA
	Blood examination	Anemia, thrombocytopenia. ↑ IgM.
	Molecular diagnosis	-
	Imaging	CT scan & MRI of the brain show cerebral edema



▪ TTT:

Early TTT	Suramin & Pentamidine
Late (Drugs that pass CNS barrier)	Melarsoprol
Supportive TTT	Treatment of anemia, dehydration and concurrent infections.



Melarsoprol

b) *Onchocerca volvulus* (Onchocerciasis) (River blindness)

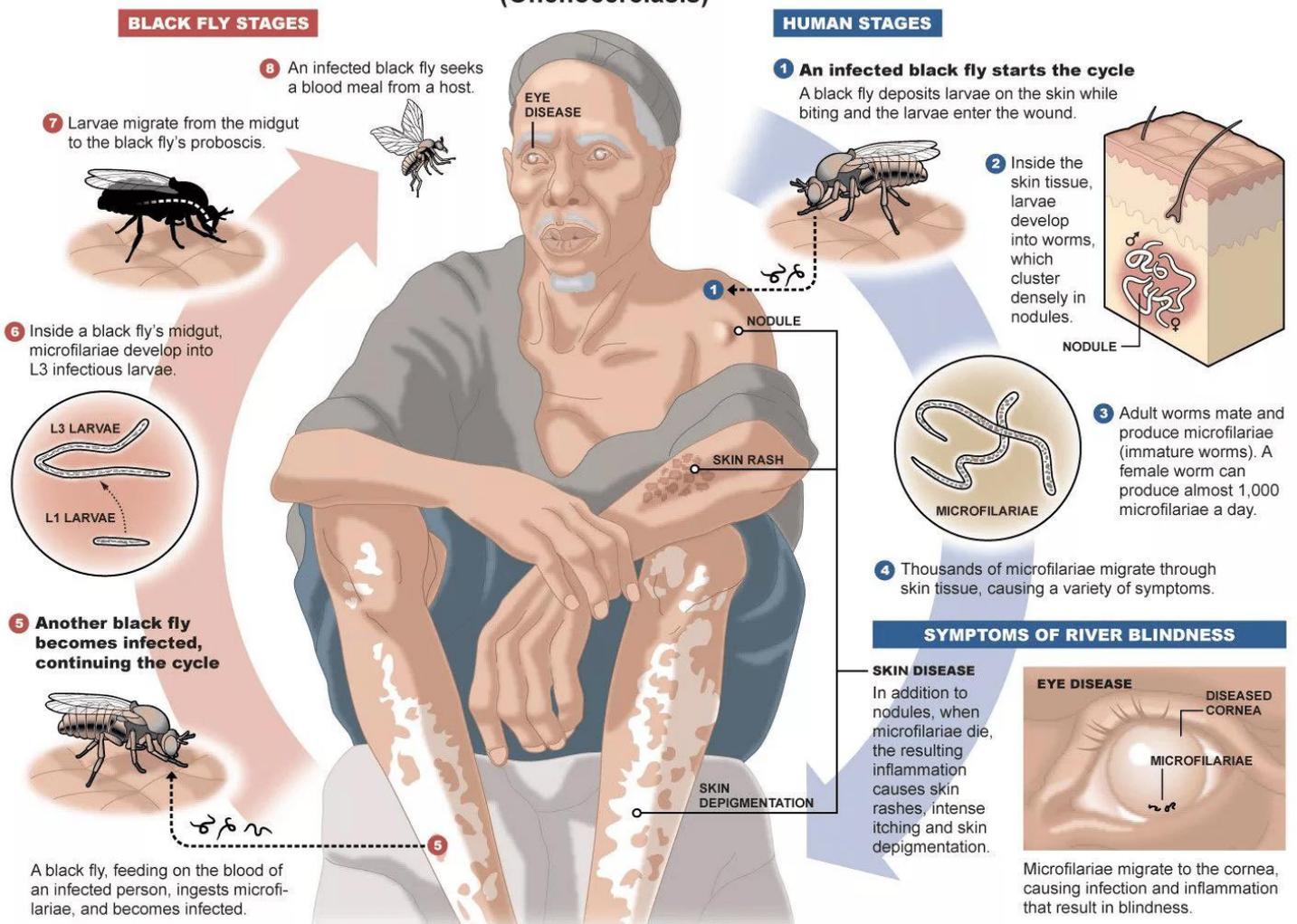
▪ Def:

- Infection of human **skin and subcutaneous tissue** by *Onchocerca volvulus* **adult and microfilaria** (Nematode).

▪ Mode of infection:

- Through inoculation of the **infective filariform larva L3** (Infective stage) present in the mouth of intermediate host (***Simulium* fly**) into skin bite.
- Adult worms live in **fibrous subcutaneous nodules** from the host reaction (not tender).

The Life Cycle of River Blindness (Onchocerciasis)



▪ Pathogenicity & Clinical Picture:

Skin manifestations	Onchocerca nodule (onchocercoma)	Smooth firm, painless fibrous nodule in the subcutaneous tissue surrounding one to several adults
	Severe dermatitis	Oedema and inflammatory cellular infiltration against microfilaria with subsequent fibrosis.
	Disturbed pigmentation	dermatitis with pruritus, pigmentation, atrophy and fibrosis
River blindness (Sudan blindness)		<ul style="list-style-type: none"> - This is a serious complication of onchocerciasis resulting in blindness. - Common when the nodules are in the scalp, neck and shoulders. - The microfilariae have great affinity to the eye tissues. - It is <u>characterized by</u>: <ul style="list-style-type: none"> Keratitis, iritis, uveitis, choroiditis, retinitis and optical atrophy which end in blindness. The most common early finding is conjunctivitis with photophobia - <u>Causes</u>: <ul style="list-style-type: none"> Hypersensitivity to toxins liberated from living and dead microfilariae. Mechanical action of the moving microfilariae in the eye tissues.

▪ Diagnosis:

Clinical	Clinical picture.	
Laboratory	Detection of microfilaria or adult worms	Skin-snip biopsy or aspiration from the nodules or tissue biopsy.
	In patients with ocular manifestations	microfilariae may be found in conjunctival biopsies.
	PCR	Of skin-snips
	Patch skin test	- 10% of Hetrazan in lanolin cream is applied to an area of skin. - In positive cases; papular eruption develop after 8-24 hours.

▪ TTT & Prevention:

TTT	Microfilaria	Ivermectin
	Adult worm	Doxycycline
	Nodules	Surgical removal
Prevention	Fly control	Control of Simulium by insecticides application to water running streams and spraying insecticides along riverbanks by airplanes
	Mass chemotherapy	By Ivermectin
	Mass nodulectomy	-

▪ **Quiz:**

Patient presented with enlarged cervical lymph nodes, hepatosplenomegaly, fever and generalized weakness. The condition started when he went for a trip in Africa, where he was exposed to numerous insect bites. He had a history of having indurated painful swelling on his face before his complaints. Then, he suffered fever, chills, aches, night sweats, and nausea. After that he developed cognitive deterioration, ataxic gait and sleepiness.

What is the most likely parasitic diagnosis?

1. Patient went to Africa and subjected to numerous insect bites. He developed enlarged cervical lymph nodes, hepato-splenomegaly, cognitive deterioration, ataxic gait, and finally sleepiness; parasite is?

- a. Primary amoebic meningoencephalitis
- b. African trypanosomiasis
- c. Onchocerciasis
- d. Neurocysticercosis
- e. Secondary amoebic abscess

Answer: B

2. What is the most common early ocular finding in *Onchocerca volvulus* infection?

- a. Blindness
- b. Optical atrophy
- c. Iritis
- d. Conjunctivitis with photophobia
- e. Keratitis

Answer: D

3. Which stage is the infective stage of *Trypanosoma brucei*?

- a. Metacyclic trypomastigote
- b. Intermediate trypomastigote
- c. Amastigote
- d. Long slender trypomastigote

Answer: A