

# Trypanosoma

**Phylum – Protozoa**

**Sub – phylum – Plasmodroma**

**Class – Mastigophora**

**Order – Protomonadina**

**Family – Trypanosomidae**

**Genus – Trypanosoma**

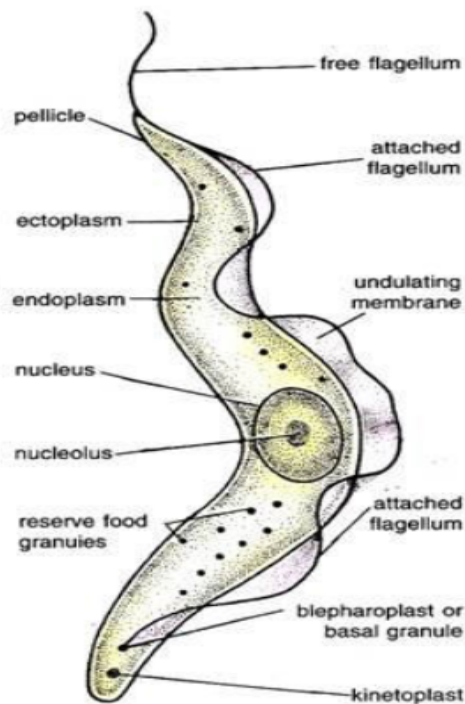
**Species – Gambiense**

## Habit and Habitat

*Trypanosoma gambiense* lives as a parasite in the blood, lymph, lymph nodes, spleen, or cerebrospinal fluid of man and in the intestine of blood-sucking fly *Glossina palpalis* (Tsetse fly).

The parasite causes a disease called Gambian or West-African sleeping sickness in human-beings. The disease African sleeping sickness was first described by Atkins in 1724 and Winterbottom in 1803, but the causative parasite was described in human blood by Forde in 1901 and later on named as *T. gambiense* by Dutton in 1903.

## Structure of Trypanosoma Gambiense:



**Fig. 13.3.** *Trypanosoma gambiense*.

**Shape and size:**

Trypanosoma gambiense has a slender, elongated, colourless, sickle-shaped and flattened microscopic body which is tapering at both the ends. The anterior end is more pointed than the posterior end which is blunt. Its body length varies from 15 to 30 microns and width from 1 to 3 microns. The shape and size of its body vary with the form in which it exists.

**Pellicle and Undulating Membrane:**

The body is covered by a thin, elastic and firm pellicle. It maintains the general shape of the body. The pellicle is made of fine fibrils which run along the whole length of the body. These fibrils are called microtubules. The pellicle is pulled out into an irregular membranous fold to one side when its flagellum beats.

This fold is called undulating membrane, which is supposed to be an adaptive structure for locomotion in a viscous environment (blood, lymph) where it lives.

**Flagellum:**

Flagellum is single in Trypanosoma, i.e., it is uniflagellate. The flagellum arises from the basal granule situated near the posterior end of the body. The flagellum runs forward and remains attached all along the length of the body marking the boundary of undulating membrane. After reaching the anterior end of the body, the flagellum becomes free and hangs freely as free flagellum. Structurally, the flagellum is like that of Euglena's and consists of the axoneme enclosed in a thin cytoplasmic sheath.

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**Kinetoplast:**

Just posterior to basal granule, there is a small, spherical or disc-shaped parabasal body or kinetoplast which contains extra-nuclear DNA and, hence, it is a self-duplicating body. The kinetoplast is related to locomotion.

**Cytoplasm:**

Its cytoplasm is differentiated into ectoplasm and endoplasm. The cytoplasm contains numerous scattered greenish refractile deep staining granules called volutin granules. The volutin granules are metabolic food reserves and generally consist of glycogen and phosphates. In addition, cytoplasm also contains some small vacuoles having hydrolytic enzymes in them and all other cellular components like Golgi apparatus, mitochondria, endoplasmic reticulum and nucleus.

**Nucleus:** A single, oval or spherical and vesicular nucleus (triphonucleus) is seen in the middle of its body. The nucleus contains a large endosome surrounded by chromatin.

### Life cycle of *Trypanosoma gambiense*

The life cycle of *Trypanosoma gambiense* is completed within two hosts, i.e., digenetic (Gr., di – double; genos = race), a primary vertebrate and secondary invertebrate host or vector. The vertebrate host is man and the invertebrate host is blood sucking fly, *Glossina palpalis* (Tsetse fly). *Trypanosoma gambiense* lives harmlessly in the blood of antelopes.

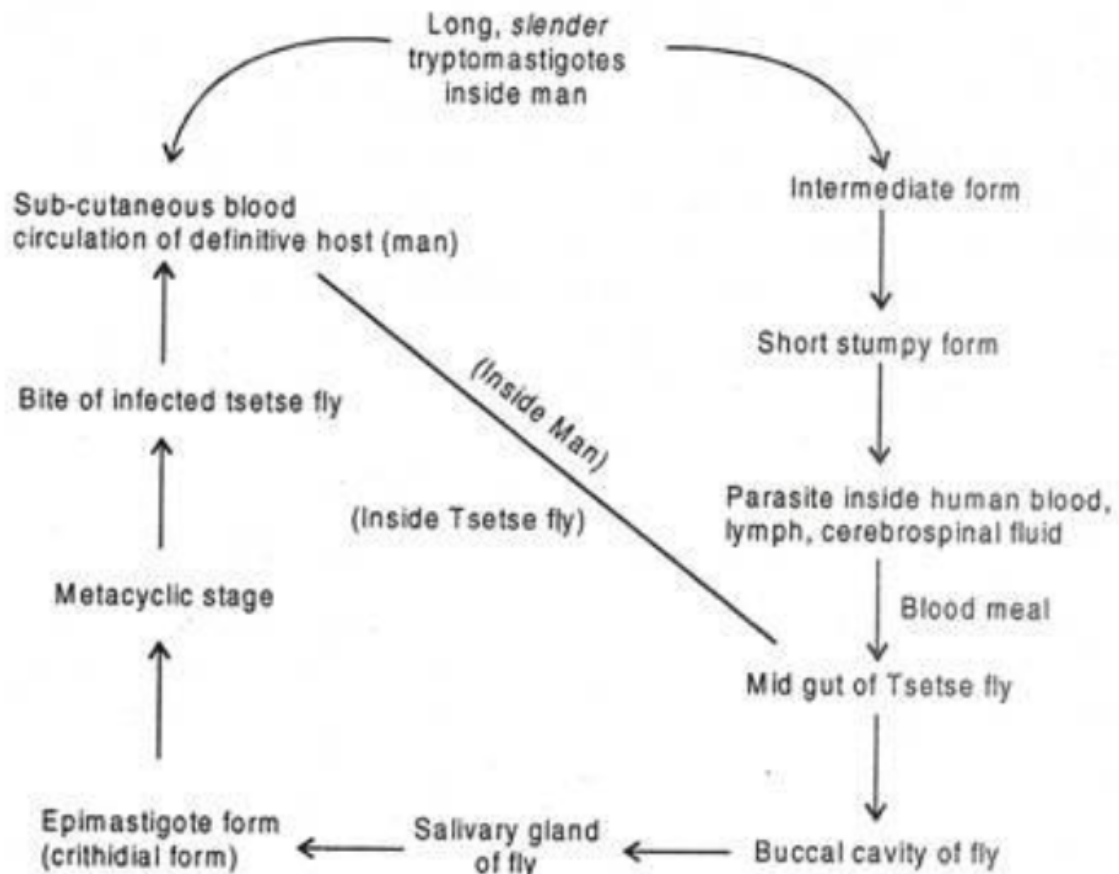


Fig. 184. Diagrammatic representation of life cycle of *T. gambiense*.

### Part of Life Cycle in Man:

When an infected fly bites a man, it inoculates a few parasites in the blood of man. The parasites first live in the blood of the infected man, but later find their way into the cerebrospinal fluid.

While the parasites are in the blood, the infected man develops a kind of fever termed Gambia fever, but when they reach the cerebrospinal fluid, various nervous symptoms are produced in the patient leading to a lethargic condition, which has given the name sleeping sickness to the disease.

**The parasites multiply by longitudinal binary fission in the blood and produce three forms of individuals, viz.,:**

- (i) Long and thin form's with a free flagellum,
- (ii) Short and stumpy forms with a reduced flagellum and
- (iii) Intermediate forms. It has been observed that the parasites periodically increase and decrease in number in the blood of man. During the period of decrease the short and stumpy forms, which have great resisting power, survive the period of depression and the rest die. These short and stumpy forms are capable of development in the intermediate host, *Glossina palpalis* (Tsetse fly).

### **Part of Life Cycle in Tsetse Fly:**

When a tsetse fly sucks the blood of an infected man, a number of parasites enter into the midgut of the fly along with the blood. These parasites remain in the midgut of the fly for a few days and start multiplying by longitudinal binary fission. After tenth to fifteenth day, long slender forms appear in great numbers which move forward to the proventriculus.

After several more days, the trypanosomes make their way to the fly's salivary gland. In the salivary glands they become attached to the walls and undergo another rapid phase of multiplication by longitudinal binary fission and develop into crithidial forms.

The crithidial forms are characterised by a shorter flagellum and undulating membrane. Flagellum and undulating membrane do not extend in the hinder part of the body. Kinetoplast and basal granule are situated above the nucleus towards the anterior end.

Here the development continues for 2-5 days and the crithidial forms produce metacyclic forms (Trypanosome forms) which are now infective. These metacyclic forms pass down through the ducts and hypopharynx. When the fly bites a man, the metacyclic forms enter the blood of man along with the saliva of the fly. The whole cycle in the fly usually takes 2-30 days.

### **Pathogenicity and Symptoms of *Trypanosoma Gambiense*:**

The bite of an infected fly is usually followed by itching and irritation near the wound, and frequently a local dark red lesion develops. In blood, the parasite multiplies and absorbs nutrients from it. After a few days, fever and headache develop, recurring at regular intervals accompanied by increasing weakness, loss of weight and anaemia.

Usually, the parasites succeed in penetrating the lymphatic glands. Because of its infection, the lymphatic glands swell and after it the parasites enter the cerebrospinal fluid and brain causing a sleeping sickness like condition.

Development of lethargic condition and recurrence of fever are the symptoms of its infection.

### **Disease Caused by Trypanosoma Gambiense:**

Trypanosoma gambiense causes trypanosomiasis; most commonly referred to as sleeping sickness leading to coma stage and finally resulting into the death of the patient. In fact, two types of diseases are caused by Trypanosome which are essentially similar in symptoms. These are Gambian and Rhodesian sleeping sickness.

The Gambian sleeping sickness occurs in western part of Africa and its vector is Glossina palpalis, while Rhodesian sleeping sickness occurs in rest of Africa and its vector is Glossina morsitans. The only difference between the two is that the latter is more rapid causing the death of the patient within 3-4 months of infection.

### **Diagnosis, Treatment and Prevention of Disease Caused by Trypanosoma Gambiense:**

The diagnosis is confirmed by examining fresh or stained peripheral blood or by examining the cerebrospinal fluid obtained by lumbar puncture or by examining the extract of enlarged lymphatic glands.

#### **Treatment**

Arsenic and antimony compounds were until recently the drugs for treatment of trypanosomiasis, but now they are rarely used except for late stages when the parasites have invaded the central nervous system.

Two drugs, Bayer 205 (also called Antrypol, Germanin or Suramin), and Pentamidine or Lomidine are now widely used for both treatment and prophylaxis of human infections. These drugs are low in toxicity, effective in treatment, and prevent reinfection for several months.

#### **Prevention (Prophylaxis) :**

**The following measures are suggested for preventing the infection of this parasite:**

1. By eradicating the vectors. The infection of this parasite can be checked by completely eradicating the secondary host (Tsetse fly). For this, the endemic areas should be kept clean and regular spray of insecticides like DDT is suggested which help in eradicating the fly.
2. Care should be taken to keep the reservoir hosts free from its infection.
3. Preventive medicines should be taken frequently and periodically which help to a great extent from its infection