

Subphylum Mastigophora (Flagellates of blood and tissues "Hemoflagellates")

□ The hemoflagellates of human include the genera *Trypanosoma* and *Leishmania*.

- 1) All these organisms require 2 hosts in their life cycle. Man or other mammals on the one hand and blood sucking insect (intermediate host) on the other.
- 2) They live in the blood and tissue of man and other vertebrate hosts, and in the gut of the insect vector.
- 3) Multiplication in both vertebrate and invertebrate hosts is by binary fission.
- 4) They exist in two or more of the four developmental forms or stages.

Hemoflagellates have 4 developmental forms:

1) **Round intracellular stage called amastigote (*Leishmania*) (Fig. 1).** The amastigote is spherical or subspherical, it lives and reproduces by longitudinal binary fission in macrophage of skin, mucosa, lymph node and RES. In preparation stained with Giemsa's or Wright's stain the cytoplasm is pale blue and the large nucleus is red stain. In their cytoplasm in the median line of the cell, there is a deep red rod like structure called kinetoplast; a delicate filament called axoneme extends from near the kinetoplast to the cell membrane.

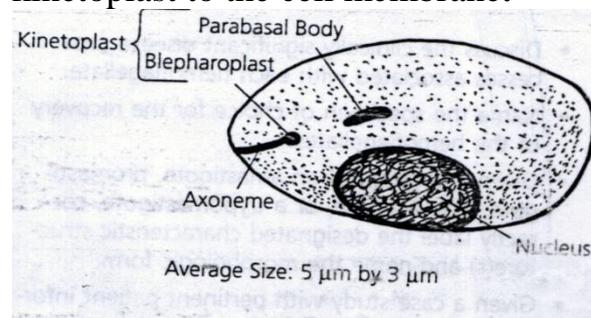


Figure 1: Amastigote

2) **Flagellated extracellular stage called promastigote (*leptomonas*).** It is the basic of the hemoflagellate. It is pyriform without an undulating membrane with a kinetoplast at the anterior end. A free flagellum near the anterior end of the cell. There is no undulating membrane (Figure 2).

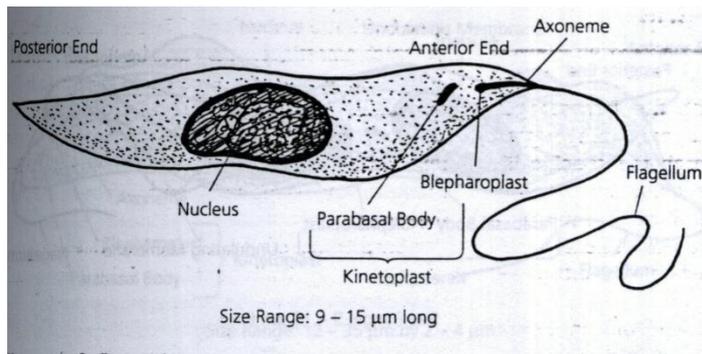


Figure 2 Promastigote

3) Epimastigote (crithidia). Elongated extracellular stage with kinetoplast placed more posteriorly close to and in front of the nucleus. The flagellum runs alongside the body as short undulating membrane before emerging from the anterior end (Figure 3).

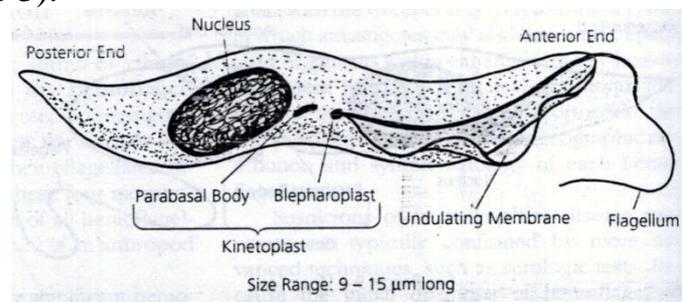


Figure 3: Epimastigote

4) Trypomastigote (trypanosoma). The cell is elongated; spindle shaped with a central nucleus and the kinetoplast posterior to the nucleus situated at the posterior end of the body. There is a long undulating membrane and a free flagellum (Figure 4).

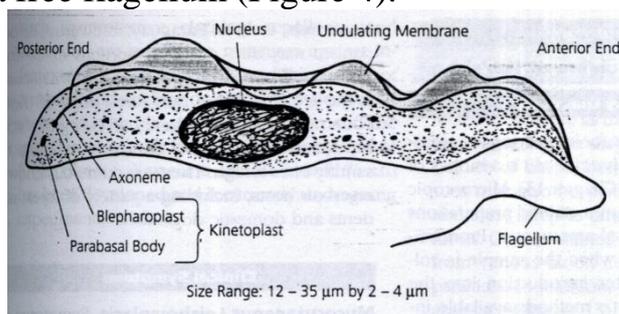


Figure 4: Trypomastigote

Leishmania

- The genus *Leishmania* has been named after Sir William Leishman, who discovered the species (*Leishmania donovani*) that cause kala-azar.
- Genus *Leishmania* are parasites of man, dog, gerbil, and other rodents which represent the definitive hosts whereas blood sucking sandfly of the

genus *Phlebotomus* (female only) serve as intermediate hosts or vectors which transmit the parasite from one mammalian host to another.

□ In man and reservoir host (dogs, rodent) , the organism in the amastigote form is a parasites of macrophage cells which multiply by binary fission and cause death of the host cells.

Morphology:

□ The leishmania of man have been grouped into 3 species.

1) *Leishmania tropica* complex cause old world cutaneous leishmaniasis.

2) *Leishmania braziliensis* complex and *Leishmania mexicana* complex cause new world cutaneous and mucocutaneous leishmaniasis.

3) *Leishmania donovani* complex cause visceralleishmaniasis.

□ **These species are morphologically similar but they differ clinically, epidemiologically, immunologically and biochemistry. Life cycle (Figure 5)**

□ 2 stages in the life cycle are known:

1) Promastigote stage in sandfly and culture.

2) Amastigote in mammals and reservoir animal.

I. When a sandfly bite an infected person or reservoir host, it sucks up parasitized macrophage or temporarily free amastigote in the blood, →

Midgut of the fly → flagellated promastigote and after rapid multiplication → infective promastigote and migrate forward.

From the foregut they are regurgitated or otherwise introduced into the skin of the next individual when the sandfly takes another blood meal.

II. When a sand fly bites another healthy persons, the fly inject the promastigote into the skin, the promastigote rapidly changed to amastigote after phagocytosis by macrophage, amastigote multiply filling the cytoplasm of macrophage. The infected cells burst, the released parasites are again phagocytosed and the process is repeated. Cutaneous or visceral leishmaniasis depending upon the species of the parasites and the host response.

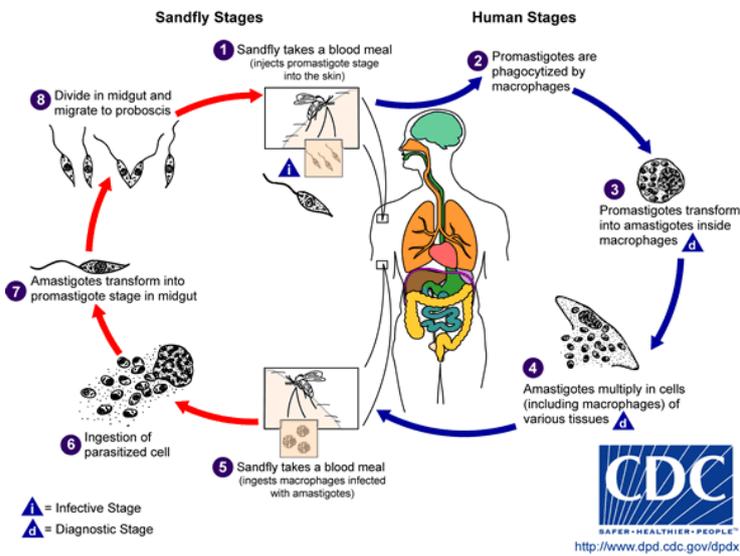
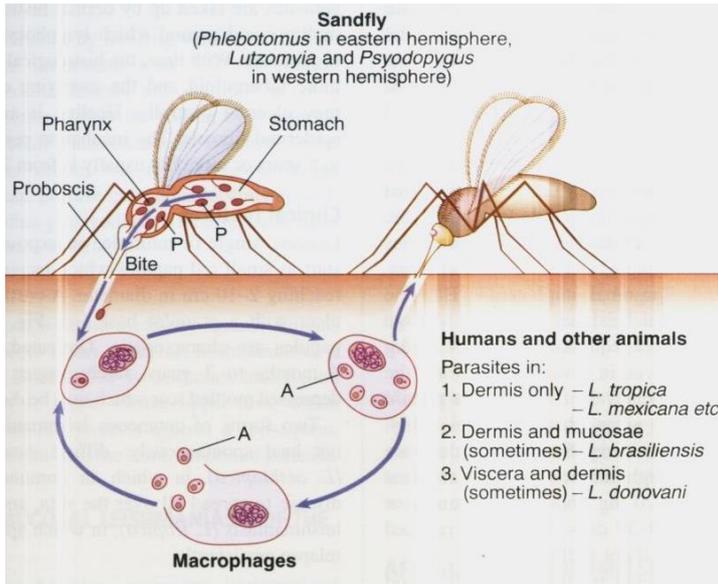


Figure 5: life cycle of leishmania (Cutaneous and Visceral)