LIFE HISTORY OF *Leishmania donovani*

SYSTEMATIC POSITION

Phylum: Protozoa
Subphylum: Plasmodroma
Class: Mastigophora
Subclass: Zoomastigophora
Order: Protomonadina
Genus: *Leishmania*
Species: *donovani*

HISTORY

- It was first discovered by **Leishman** and **Donovan** in **1903**.

HABIT AND HABITAT

- It leads an intracellular endo-parasitic life in reticuloendothelial cells of visceralorgans particularly in spleen, liver and bone marrow and causes **Kala-azar**.
- It also undergoes multiplication and biological changes in the foregut and salivary glands of sand fly (***Phlebotomus argentipes***).

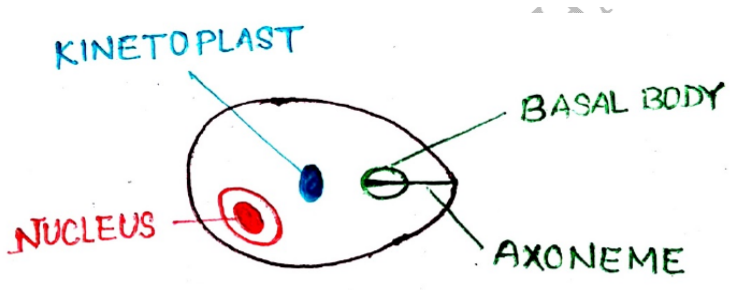
OCCURANCE

- It is found in India (Assam, Bengal, Bihar, UP and Chennai), China, Sudan and in some parts of Africa and South America.

STRUCTURE

- *Leishmanial donovani* is dimorphic.
- Two different forms found during its life cycle are named Leishmania and Leptomonad forms.

A. LEISHMANIA FORM

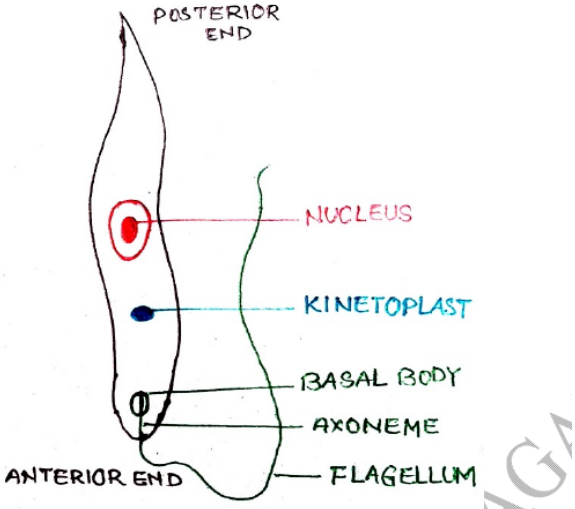


Fig; Leishmania form

(i) It is also called amastigote form.
(ii) This form is found in man.
(iii) It is small, spherical or oval and colourless having a diameter of 1.5 - 4µ.

(iv) Body is covered with very thin membranous pellicle.
(v) Homogenous cytoplasm is not divisible into ecto and endoplasm.
(vi) A big spherical eccentric nucleus surrounded by an obvious nuclear membrane is present.
(vii) It contains a **blepharoplast** (connected to kinetoplast by rhioplast) and an axoneme.
(viii) Flagellum and undulating membrane are absent.

B. LEPTOMONAD FORM

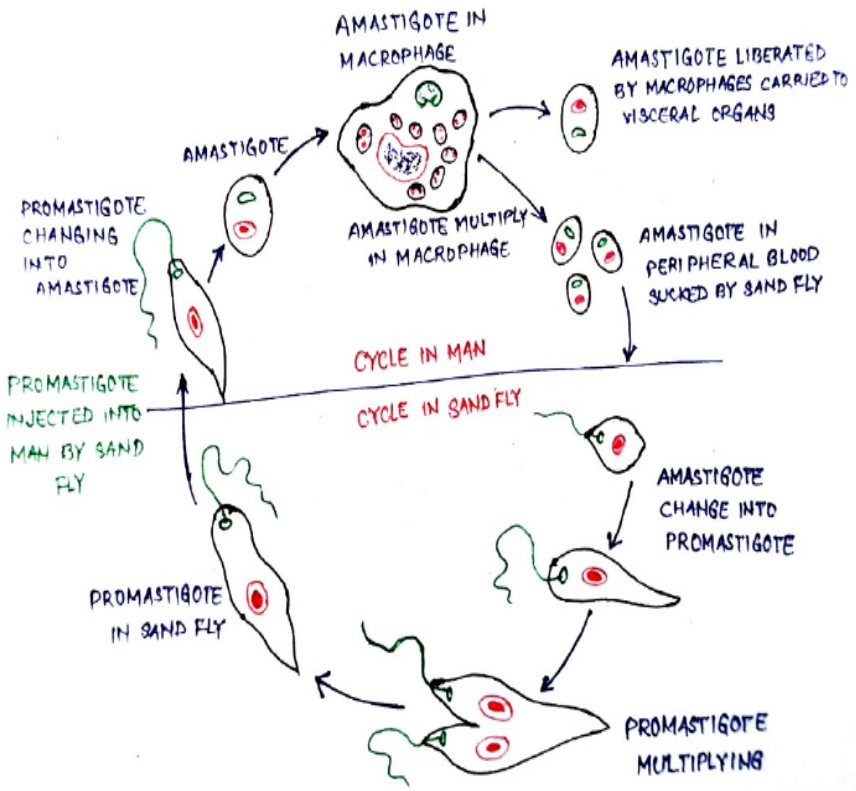


Fig; Leptomonad form

(i) It is also called promastigote form.
(ii) It is found in sand fly.
(iii) It is fusiform in shape with pointed posterior and slightly blunt anterior end.
(iv) It measures about 10 - 20µ in length and 1.5 - 3µ in breadth.
(v) Its homogenous cytoplasm is not distinguishable into ecto and endoplasm.
(vi) It has a spherical or oval nucleus placed near about the middle of the body.
(vii) A transversely placed kinetoplast lies at the anterior end of the body which remains connected to the slightly anteriorly placed blepharoplast.
(viii) A free flagellum originates from the blepharoplast.

LIFE-CYCLE

- *Leishmanial donovani* is digenetic and completes its life-cycle in man and sand fly.



Fig; Life cycle of Leishmania donovani

IN MAN

- The parasites (amastigote) residing in the reticuloendothelial cells derive their nourishment by simple diffusion through the general body surface from the cell material.
- These multiply their number by repeated binary fission, on being innumerable, these exert a pressure on the cell wall which results in bursting of the cell and release of parasites in the infected area.
- These released parasites invade the fresh cells.

IN SAND FLY

- When a sand fly sucks blood from a person suffering from leishmaniosis, a large number of parasites pass to the alimentary canal of the fly with sucked blood.
- Now the amastigote form changes into promastigote form in the foregut of the sand fly by elongation of the body and development of a flagellum on the anterior end.
- These derive their nourishment from the material available in the foregut and multiply their number by repeated longitudinal binary fission.

- About after a week, these migrate to salivary gland, hypopharynx and labial palps, where these wait for their entrance into the blood stream of human beings during the pouring of saliva at the time of blood suck by sand fly.
- Sand fly is said to be in infective stage during this period.
- After getting entry into the blood of man become changed into amastigote form and restart next cycle.

Pathogenicity caused by *Leishmania donovani*:

- *Leishmanial donovani* caused leishmaniosis which is popularly known as **Kalaazar.**
- This disease is characterized by:

(i) Fever and boneache.
(ii) Enlargement of liver and spleen.
(iii) Blackness and dryness of skin.
(iv) Anaemia in case of bone-marrow invasion.

TREATMENT

- Leishmaniosis is cured by treatment with:-

1. Antimony compounds:- Such as neostibosan, solustibosan, ureastabimine, neostan etc.

2. Non-metallic compounds:- Such as pentamidine, isethionate, lomodine.

PREVENTION

1. Destruction of sand fly by spraying insecticides.
2. Keeping away from the sand fly bite.