

LEISHMANIA DONOVANI

Leishmania is an important haemoflagellate which occurs in the vertebrate host like man, cattle, dog, sheep, horse etc. and causes a serious disease called Leishmaniasis. All types are carried by the blood sucking sandflies of the genus Phlebotomus. Three very closely similar species are commonly pathogenic to man. They are -

- 1) Leishmania tropica :- parasitic in blood and reticulo-endothelial cells in the skin causing oriental or Baghdad sore i.e. cutaneous leishmaniasis.
- 2) Leishmania brasiliensis - parasitic in cutaneous and mucocutaneous parts causing Espundia or mucosal leishmaniasis.
- 3) Leishmania donovani - parasitic in reticulo-endothelial cells of visceral organs especially spleen causing Kala Azar, Dumdum fever or oriental fever.

The species Leishmania donovani was reported simultaneously by Leishman from London (1903) and Donovan from Madras (1903) hence the name Leishmania donovani.

The systematic position of Leishmania is -

Phylum - Protozoa
 Superclass - Mastigophora
 Class - Zoomastigophora
 Order - Kinetoplastida
 Genus - Leishmania
 Species - donovani

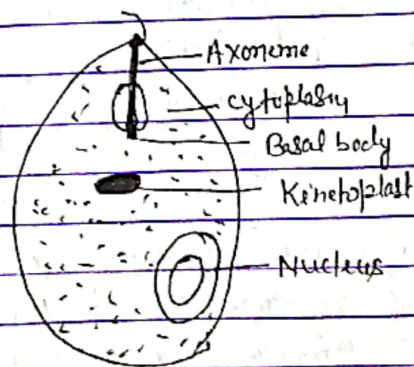
Distribution - L. donovani has been reported from India, China, Russia, Mediterranean countries and in some parts of Africa and South America. In India it is reported from eastern India like, Assam, Bengal, Bihar, Orissa, east U.P and Tamil Nadu.

Habit and Habitat — In man, it is an intracellular parasite in leucocytes, hepatocytes, spleen, bone marrow, lymphatic glands etc.

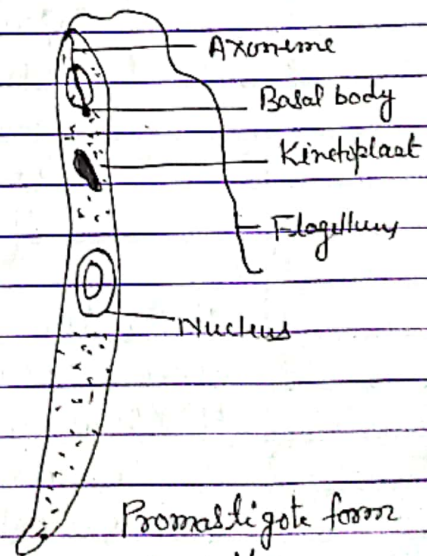
Morphology — *L. donovani* occur in two forms — Leishmanial or amastigote form and Leptomonad or Promastigote form. The two forms are recognised on the basis of their kinetoplast and blepharoplast and the course taken by the flagellum.

A. Leishmanial or Amastigote form — It occurs inside macrophages reticulo endothelial cells, spleen, liver cell, lymph glands etc. It is microscopic, rounded or oval with a central or eccentric nucleus, kinetoplast, blepharoplast but no free flagellum. It measures 2 μ to 4 μ in diameter. A thin pellicle gives shape to the body. cytoplasm is colourless homogeneous and not differentiated into ectoplasm and endoplasm. It is well marked by longitudinal striation or microtubules which may be contractile in nature. Other structure present in the cytoplasm are Golgi apparatus, mitochondria, ER and etc. The mitochondria is however poorly developed in the amastigote.

There is a single large eccentric nucleus with a distinct nucleolus. The kinetoplast is composed of DNA and is situated within the mitochondrion.



Amastigote form
in man.



Promastigote form
in Sand fly.

B. Leptomonad or Promastigote :- It is found in the body of the intermediate host the sand fly (*Phlebotomus argentipes*). It is elongated, slender, spindle shaped with a large centrally placed nucleus, blepharoplast, kinetoplast and a long free flagellum. It measures 15-20 μ in length and 1-2 μ in width. In this stage, mitochondria is curved and prominent.

METABOLISM - The nourishment is obtained sapro-phytically through body surface from the host cell. Respiration and excretion also occur by simple diffusion.

Reproduction and Life cycle :-

Both the Amastigote and Promastigote forms are reproduced by binary fission (longitudinal fission). Sexual reproduction is unknown.

Life cycle :- *L. donovani* is a digenetic parasite as it requires two hosts for completion of its life cycle. The Primary or Principal host is a vertebrate or man and the Secondary or intermediate host is blood sucking insect or sandfly.

cycle in man :- *L. donovani* lives inside the cell of reticuloendothelial system. It is the promastigote stage that get enter into the vertebrates including man. Promastigote divide by binary fission in within the macrophages. It transform into amastigote stage. Multiplication cycle is repeated so that the reticulo-endothelial ~~cell~~ system gets progressively infected. Some of the free amastigotes becomes phagocytosed by neutrophils and macrophages.

cycle in sandfly :- After sucking an infected person, sandfly obtains free amastigote as well as the parasitised neutrophil and monocytes.

The amastigote multiplies by repeated longitudinal binary fission in the midgut during 4-5 days of the blood meal. The parasite migrates forward and the foregut is occupied by the flagellate parasites. It gradually moves into the salivary gland by 7-8 days.

Transmission into a new host occurs when such a heavily infested sandfly bites the another host.

Pathogenesis :- Incubation period is from 3 to 6 months and symptoms may appear even after 2 yrs. The parasite spreads to the viscera like spleen, liver and bone marrow etc. The harmful effects are due to the blockage of the RES and anaemia.

Other symptoms of Kala-azar are swelling, enlargement of spleen and liver. In advanced stage, skin gets dry, rough and dark or pigmented. Hair becomes brittle and fall out.

If not treated, the patient dies due to secondary infections by bacteria or viruses.

