

# HAEMOFLAGELATES

There are a number of hemoflagellate species known to cause human infections, only those hemoflagellates known to cause more frequent human disease are covered.

## Leishmania Species

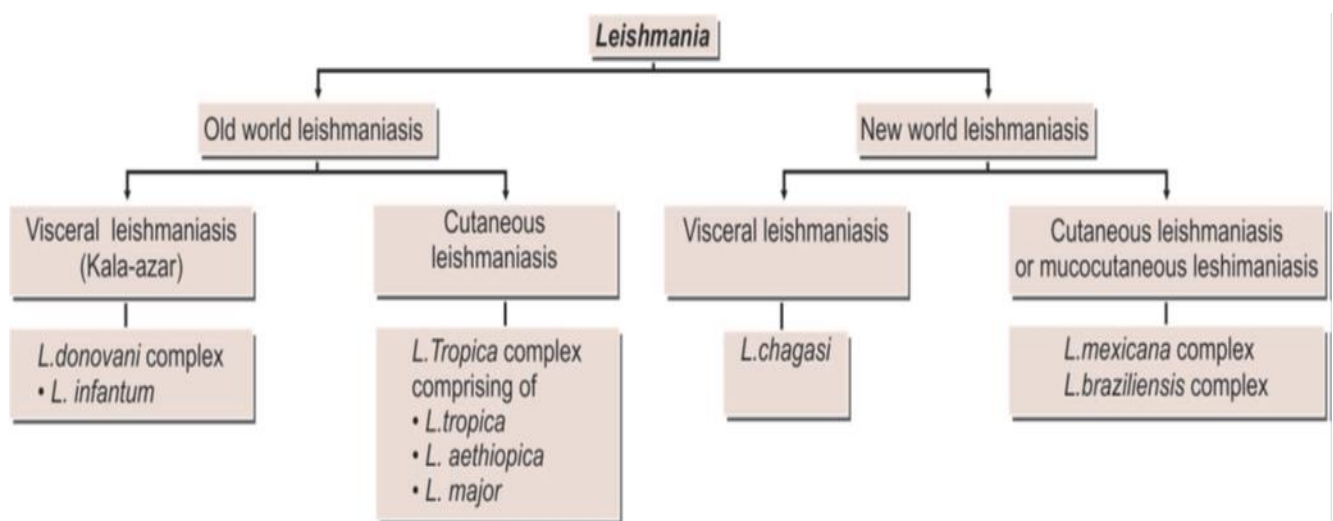
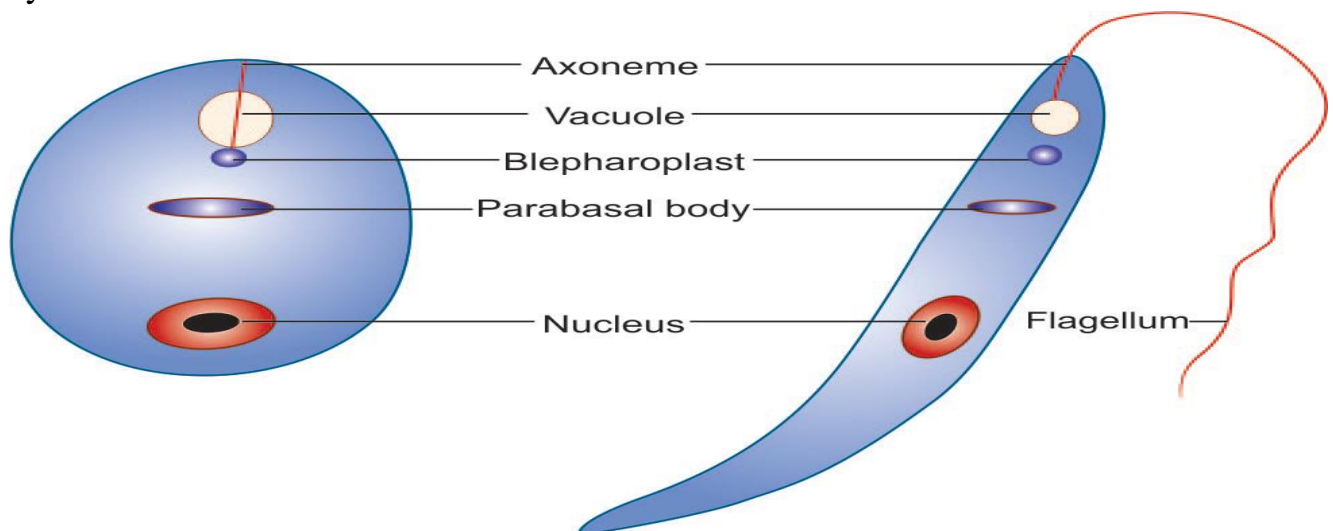
### Clinical disease

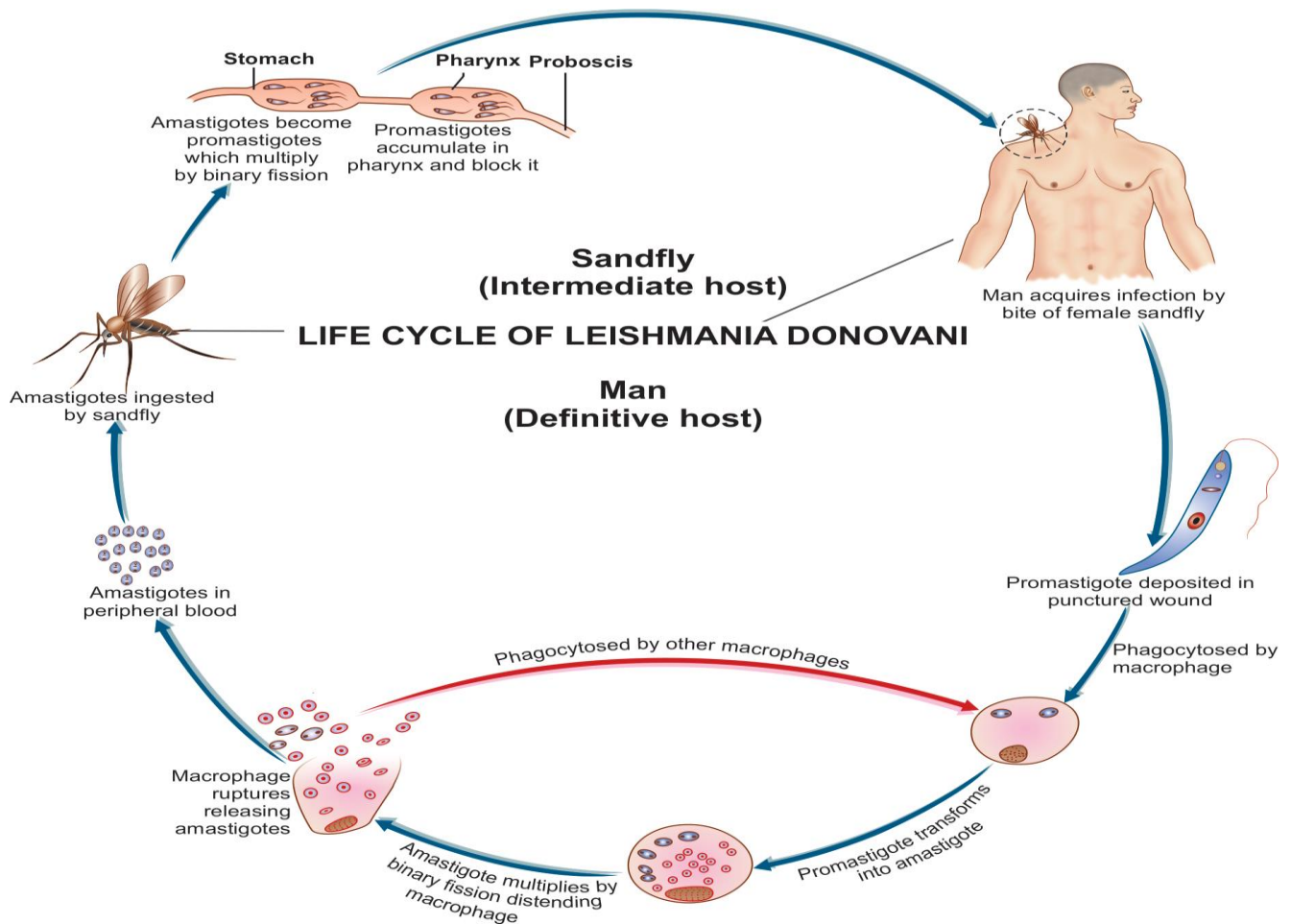
- Visceral leishmaniasis
- Cutaneous leishmaniasis
- Mucocutaneous leishmaniasis

The species of leishmania exist in two forms,

**Amastigote (aflagellar occurs in man)** known as LD bodies. and

**Promastigote (flagellated occurs in gut of sandfly and artificial culture)** in their life cycle.





### Mode of transmission:

Humans acquire by bite of an infected female sandfly.

€ It can also be transmitted vertically from mother to fetus, by blood transfusion, and accidental inoculation in the laboratory.

Incubation period: Usually 2–6 months, occasionally it may be as short as 10 days or as long as 2 years.

#### A. visceral leishmaniasis

*L.donovani* complex

#### B. Mucocutaneous leishmaniasis

*L.braziliensis* complex

#### C. Mucocutaneous leishmaniasis

*L.tropica*

*L.aethiopica*

*L.major*

*L.braziliensis* complex

*L.mexicana* complex

## ***Visceral leishmaniasis***

### ***Leishmania donovani***

*L. donovani* causes visceral leishmaniasis or Kala-azar. It also causes the condition, Post Kala-azar Dermal Leishmaniasis (PKDL).

**Important features-** the natural habitat of *L. donovani* in man is the reticuloendothelial system of the viscera, in which the amastigote multiplies by simple binary fission until the host cells are destroyed, whereupon new macrophages are parasitized. In the digestive tract of appropriate insects, the developmental cycle is also simple by longitudinal fission of promastigote forms. The amastigote stage appears as an ovoidal or rounded body, measuring about 2-3µm in length; and the promastigotes are 15-25µm lengths by 1.5-3.5µm breadths.

### **Pathogenesis**

In visceral leishmaniasis, the organs of the reticuloendothelial system (liver, spleen and bone marrow) are the most severely affected organs. The spleen is the most affected organ. Reduced bone marrow activity, coupled with cellular distraction in the spleen, results in anaemia, leukopenia and thrombocytopenia. This leads to secondary infections and a tendency to bleed. The spleen and liver become markedly enlarged, and hypersplenism contributes to the development of anaemia and lymphadenopathy also occurs. Increased production of globulin results in hyperglobulinemia, and reversal of the albumin-to-globulin ratio.

### **Clinical features**

Symptoms begin with intermittent fever, weakness, and diarrhea; chills and sweating that may resemble malaria symptoms are also common early in the infection. As organisms proliferate & invade cells of the liver and spleen, marked enlargement of the organs, weight loss, anemia, and emaciation occurs. With persistence of the disease, deeply pigmented, granulomatous lesion of skin, referred to as post-kala-azar dermal leishmaniasis, occurs.

Untreated visceral leishmaniasis is nearly always fatal as a result of secondary infection.

### **Immunity**

Host cellular and humoral defence mechanisms are stimulated.

### **Laboratory diagnosis**

- ✓ Examination of tissue biopsy, spleen aspiration, bone marrow aspiration or lymph node aspiration in properly stained smear (e.g. Giemsa stain). On staining with Giemsa or wright stain, the cytoplasm appears pale blue, the nucleus res and the kinetoplast bright red.
- ✓ The amastigotes appear as intracellular & extra cellular *L. donovan* (LD) bodies.

Culture of blood, bone marrow, and other tissue often demonstrates the promastigote stage of the organisms. **N.N.N (Novy, MacNeal, Nicolle)** medium is used for culture and incubated at 22°-24°C.

- ✓ Serologic testing is also available.

### **Prevention**

- Prompt treatment of human infections and control of reservoir hosts.
- Protection from sand flies by screening and insect repellents.

### **Old World Cutaneous Leishmaniasis (Oriental sore)**

#### **Clinical disease**

*L.tropica minor* - dry or urban cutaneous leishmaniasis

*L.tropica major* - wet or rural cutaneous leishmaniasis

*L.aethiopica* - cutaneous leishmaniasis

#### **Important features**

These are parasites of the skin found in endothelial cells of the capillaries of the infected site, nearby lymph nodes, within large mononuclear cells, in neutrophilic leukocytes, and free in the serum exuding from the ulcerative site. Metastasis to other site or invasion of the viscera is rare.

#### **Pathogenesis**

In neutrophilic leukocytes, phagocytosis is usually successful, but in macrophages the introduced parasites round up to form amastigote and multiply. In the early stage, the lesion is characterized by the proliferation of macrophages that contain numerous amastigotes. There is a variable infiltration of lymphocytes and plasma cell. The overlying epithelium shows acanthosis and hyperkeratosis, which is usually followed by necrosis and ulceration.

#### **Clinical features**

The first sign, a red papule, appears at the site of the fly's bite. This lesion becomes irritated, with intense itching, and begins to enlarge & ulcerate. Gradually the ulcer becomes hard and crusted and exudes a thin, serous material. At this stage, secondary bacterial infection may complicate the disease. In the case of the Ethiopian cutaneous leishmaniasis, there are similar developments of lesions, but they may also give rise to diffuse cutaneous leishmaniasis (DCL) in patients who produce little or no cell mediated immunity against the parasite. This leads to the formation of disfiguring nodules over the surface of the body.

#### **Immunity**

Both humoral and cell mediated immunity (CMI) are involved.

## Prevention

- Prompt treatment & eradication of ulcers
- Control of sand flies & reservoir hosts.

## Diseases and Conditions Associated with Leishmaniasis

**Baghdad boils:** A common name for an infection with *Leishmania tropica*; it is a cutaneous form of leishmaniasis presenting with pus-containing ulcers

**Bay sore:** A common name for a cutaneous form of infection caused by *Leishmania mexicana*

**Chiclero ulcer:** A form of cutaneous leishmaniasis caused by *L. mexicana*; it is commonly found in Belize, Guatemala.

**Dum dum fever:** A common name for the visceral leishmaniasis caused by *Leishmania donovani*

**Kala-azar:** Another name for the most severe form of visceral leishmaniasis caused by members of the *Leishmania donovani* complex

**Oriental sore:** A common reference for the cutaneous leishmaniasis caused by the infecting agents comprising the *Leishmania tropic* complex.