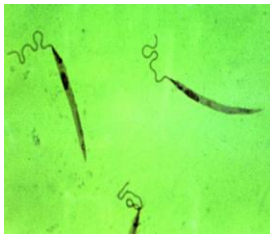
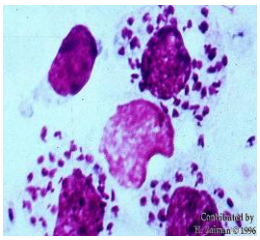
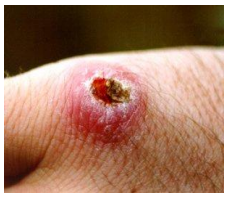
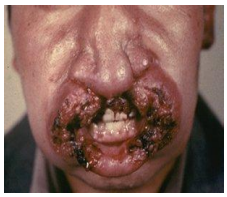
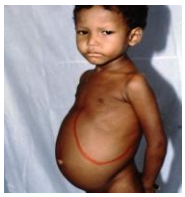
Unit VII – Problem 9 – Microbiology: Leishmania

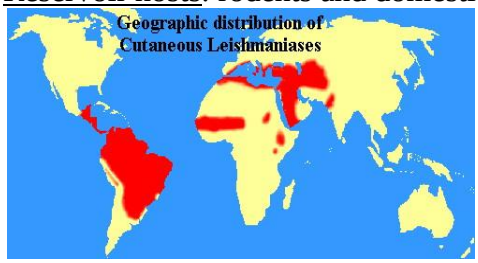
- **History of the disease:**
  - In 1901, William Leishman identified certain organisms in smears taken from the spleen of a patient who had died from dum-dum fever in India.
  - In 1903, Charles Donovan described them as being new organisms.
- **Leishmania:**
  - **Type**: protozoan parasite.
  - **It is present in two forms:**
    - ✓ Motile promastigotes (which are present in the vector: sand-fly).
    - ✓ Non-motile amastigotes (which are present in macrophages of mammalian hosts).

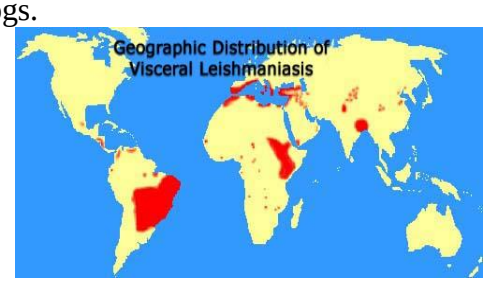



  - **Disease which they cause is called: Leishmaniasis. This disease is present in 3 forms:**
    - ✓ Cutaneous: infection remains localized (ulcer). It is caused by:
      - ❖ *L.major.*
      - ❖ *L.tropica.*
      - ❖ *L.aethiopica.*

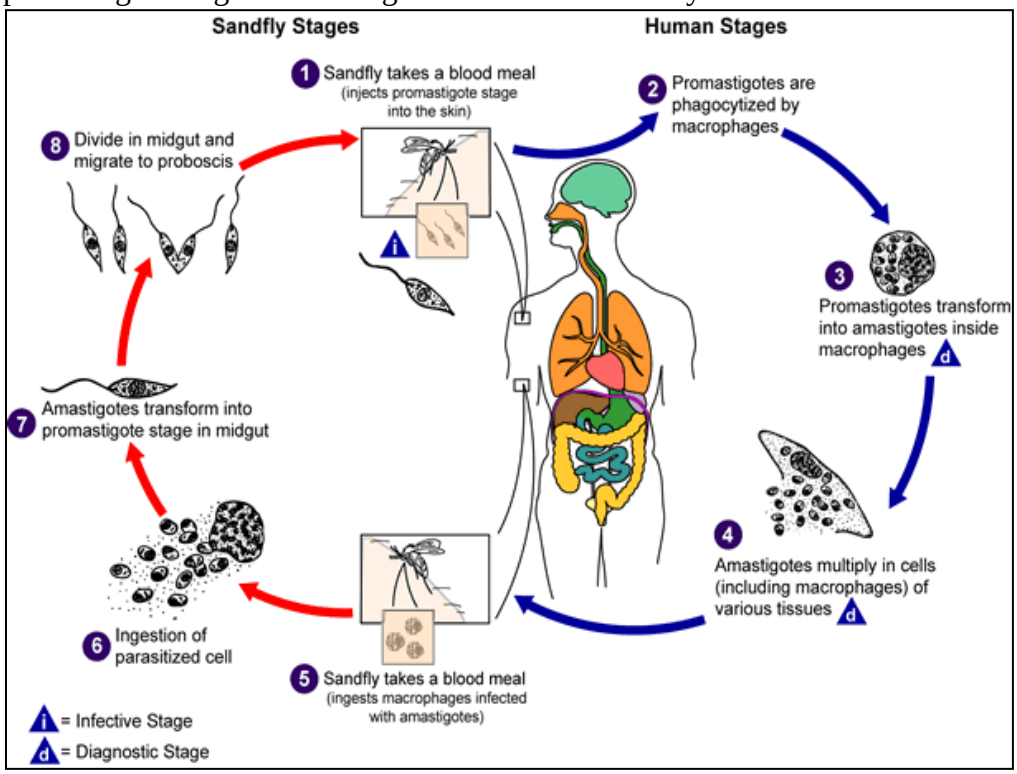
    - ✓ Mucocutaneous: results from immune reaction. It is caused by:
      - ❖ *L.braziliensis (south and central America).*
    - ✓ Visceral: no local ulcer (parasites disseminate to liver, spleen & bone marrow). It is caused by:
      - ❖ *L.donovani*
      - ❖ *L.chagasi (south America).*
      - ❖ *L.infantum*
  - **Epidemiology:**
    - ✓ There are 12 million cases worldwide (1.5-2 million cases annually).
    - ✓ Classified into:
      - ❖ *Old world (Asia, Africa and Mediterranean).*
      - ❖ *New world (Americas).*
    - ✓ Transmitted by: different species of sandflies:
      - ❖ *Old world*: Phlebotomus.
      - ❖ *New world*: Lutzomyia.
    - ✓ Reservoir hosts: rodents and domestic dogs.





  - **Life cycle:**
    - ✓ Infective stage: a female sandfly takes a blood meal from a human injecting metacyclic promastigotes in his skin.
    - ✓ Diagnostic stage: promastigotes will be phagocytized by macrophages in which the promastigotes will transform to amastigotes and multiply there (intracellularly) escaping the host defense by being resistant to lysosomal enzymes.

- ✓ A female sandfly will take a blood meal (ingesting macrophages infected with amastigotes.
- ✓ Parasitized cells will be ingested and amastigotes will transform to promastigote stage in the midgut of the female sandfly.



- **Diagnosis & outcome of the disease:**
  - ✓ <u>Cutaneous:</u>
    - ❖ It is self-limited.
    - ❖ Ulcers heal in few months leaving scars.
    - ❖ In some individuals it may become chronic.
    - ❖ *Diagnosis of cutaneous leishmaniasis:*
      - Clinical manifestations + demonstration of parasites from the ulcer (smear or culture).
      - Montenegro test: delayed hypersensitivity skin test with killed promastigotes.
  - ✓ <u>Mucocutaneous:</u>
    - ❖ In 1-3% of patients, there will be metastatic spread to nasal, pharyngeal and buccal mucosa.
    - ❖ May appear months to years after initial lesion has healed.
  - ✓ <u>Visceral:</u>
    - ❖ Organisms disseminate to liver, spleen and bone marrow.
    - ❖ *Incubation period*: 2-6 months.
    - ❖ *Clinical features*: chronic fever, hepatomegaly, splenomegaly, anemia, leucopenia and hypergammaglobulinemia.
    - ❖ *Prognosis*: high fatality rate if untreated.
    - ❖ Post Kala-Azar Dermal Leishmaniasis (PKDL).
    - ❖ *Diagnosis of visceral leishmania:*
      - Demonstration of parasites by tissue aspirates:
        - ➢ Liver.
        - ➢ Spleen (sensitivity > 98%) but there is a hemorrhage risk to the patient.
        - ➢ Sterna bone marrow (sensitivity 60-85%).
      - Parasite culture: not useful diagnostically.

- Inoculation of laboratory animals (hamsters, mice, guinea pigs): not usually performed for routine diagnosis.
- Immunodiagnosis:
  - Antigens detected in urine (Kala-Azar).
  - Antibody detection: IFA, DAT, ELISA and skin testing.
- DNA detection: PCR

- **Prevention and control:**
  - ✓ Pentavalent antimony drugs (details in pharmacology note).
  - ✓ Avoidance of sandfly bites by:
    - ❖ Use of insecticides.
    - ❖ Sleeping under bed net.
  - ✓ Vaccination: which is produced in Razi institute in Tehran-Iran.