

Lecture – 11
Haemoflagellates
(Leishmaniasis & Trypanosomiasis)



Microbiology Team 430

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Leishmaniasis

A disease caused by leishmania parasites, and transmitted by **sand fly** bite as **promastigotes** (infective stage). Inside humans they are found in macrophages and tissue as **amastigotes** (diagnostic phase). According to the leishmania species the disease can be classified into **cutaneous** (self limiting) and **visceral** (more severe and fatal if not treated).

Pathogen

Leishmanias:

- **Cutaneous leishmaniasis:** *L. Tropica* and *L. Major*
- **Visceral leishmaniasis:** *L. Donovanii* and *L. Infantum*

Mucocutaneous leishmaniasis

More severe skin ulcer caused by *L. braziliensis*
Endemic in South America

Life cycle

Found in humans and rattans as **amastigote** → sand fly takes a blood meal → amastigote grow to **promastigote** in sand fly → sand fly takes blood meal and infect humans by promastigote → promastigote phagocytized by macrophages → promastigote transform to amastigote → amastigote multiply in cells (**including macrophages**) of human tissue → sand fly transmit the disease again

Leishmanias live in 2 forms:

- **Amastigote** (no visible flagella): *found inside human tissue and macrophages*
- **Promastigote** (anterior flagella): *found and develop inside sand fly, they are the infective stage*
(Sand fly female is the vector for the disease)

Cutaneous leishmania

Etiology

- **L. Tropica:** cause dry skin lesion with **mild** ulcer, their cycle is maintained by humans
- **L. Major:** cause wet skin lesion with **severe** reaction, their cycle is maintained by rattans

Affect skin only

Clinical presentation

- **Oriental sore** (most common) usually it is **self limiting**, heal in 1 year and lifelong immunity appear.

Rare types of cutaneous leishmania:

- **Diffuse Cutaneous leishmania:**
Caused by *L. aethiops*, diffuse nodular non-ulcerating lesions
- **Leishmaniasis recidiva** (lupoid leishmaniasis):
Severe immunological reaction to leishmania antigen leading to persistent dry skin lesions

Diagnosis

- **Skin Smear:** see **LD bodies** (Leishman Donovan bodies) under microscope, Giemsa stain.
- **Biopsy:** (Microscopy) → see **LD bodies** or (Culture) → **grow as promastigote, in NNN medium.**
(Biopsy is taken by scraping the skin)

Treatment

- It is **self limiting**, skin lesion heals in 1 year
- **Medical treatment:** Antimony (pentostam) and Amphotericin B (AmB)
- **Surgical treatment:** Cryosurgery or Excision or Curettage.

Cryosurgery: **is the application of extreme cold to destroy abnormal or diseased tissue**

Excision: **removal by cutting.**

Curettage: **medical procedures, to remove tissue by scraping or scooping**

Visceral leishmania (Kala-Azar)

Etiology

- **L. Infantum**: affect children
- **L. Donovanii**: affect adults

Amastigotes are found in **bone marrow** and **the reticuloendothelial system**

Clinical presentation

- **Fever** (2 times a day)
- **Splenomegaly, hepatomegaly**, hepatosplenomegaly
- **Weight loss**
- Anemia
- Epistaxis (**bleeding from nose**)
- Cough
- Diarrhoea

After recovery it might produce a condition called **post kala-azar dermal leishmaniasis (PKDL)**
The reason why this occur is not known

Diagnosis

- **Parasitological diagnosis:**

- **Bone marrow aspirate** (Gold standard)

- Splenic aspirate
- Lymph node
- Tissue biopsy

- **Microscopy** → **Amastigotes (LD bodies)**

OR

- **Culture (NNN medium)** → **Promastigotes**

- **Immunological diagnosis:**

- **Serological tests:** (ELISA, IF, DAT)
- **Skin test** (leishmanin test)
- **formol-gel** → hypergammaglobulinaem (non-specific)

Treatment

- *If not treated can be fatal, and it is not usually suspected*
- *Medical treatment: Antimony (pentostam) and Amphotericin B (AmB)*
- *Treatment of complications: e.g. anemia, bleeding, infection*

Trypanosomiases

Trypanosomiases are diseases caused by Trypanosomes parasites. It is found in **Africa as African sleeping sickness** and in **Latin America as Chagas disease**. The African sleeping sickness is caused by **Trypanosoma brucei**, and the **tsetse fly** is the vector. Chagas disease is caused by **Trypanosoma cruzi**, and **Reduviid bugs** are vectors.

Pathogen

- **African sleeping sickness:** **Trypanosoma brucei**
- **Chagas disease:** **Trypanosoma cruzi**

African sleeping sickness

Etiology

Trypanosoma brucei:

- *T. rhodesiense* (in east Africa): mainly in wild animals (more severe, patients die in the 2nd stage)
- *T. gambiense* (in west and central Africa): in humans

Life cycle

- **Tsetse fly is vector**
- **Tryptomastigotes → diagnostic phase** , **metacyclic tryptomastigotes → infective phase**

Clinical presentation

The African sleeping sickness consists of **3 stages**:

1. **Skin stage**
Chancres (Primary sore or ulcer at the site of entry of a pathogen)
2. **Haematolymphatic stage** (Winterbottom's stage)
Generalized **lymphadenopathy**, and anemia
3. **CNS stage (deep coma)**
Meningoencephalitis

Winterbottom's sign (lymphadenopathy)

Swelling of lymph nodes along the back of the neck, in the posterior cervical chain of lymph nodes, as trypanosomes travel in the lymphatic fluid and cause inflammation

Diagnosis

- **lymph node aspiration** (in Winterbottom's stage) → Microscopy
- CSF aspiration (in CNS stage) → Microscopy

Treatment

- Early infection: pentamidine or suramin
- Late infection: eflornithine (Diflouromethylornithine- DFMO)

Chagas disease

Etiology

- *Trypanosoma cruzi* (found in Latin America)

Life cycle

- **Reduviid (Triatomine) bugs are vectors**

Clinical presentation

- **Chagoma "cutaneous stage"** (local swelling where the parasite entered the body)
- **Ocular lesion "Romana's sign"** (swelling of the eyelids on the side of the face near the bite wound)
- **Heart damage "Myocarditis"** (in chronic stage)

Diagnosis

- Blood film (in acute stage)
- Serology (in chronic stage)
- Xenodiagnosis

Xenodiagnosis a method of diagnosing a vector-transmitted infection, in which a pathogen-free insect is allowed to suck blood from a patient, the intestinal contents of the insect are then examined for the presence of pathogen

Treatment

- benznidazole
- nifurtimox

Summary

1. there are 2 main types of leishmaniasis *cutaneous* and *visceral*

<i>leishmaniasis</i>	<i>cutaneous</i>	<i>visceral</i>
Pathogen	<i>L. Tropica</i> and <i>L. Major</i>	<i>L. Donovanii</i> and <i>L. Infantum</i>
Vector	Sand fly	
Occur in	<i>skin</i>	<i>the reticuloendothelial system (spleen, liver and bone marrow)</i>
Clinical presentation	- <i>Skin sore</i>	- <i>Hepatosplenomegaly</i> - <i>Fever, Anemia, weight loss, diarrhea</i>
Diagnosis	- <i>Skin biopsy or smear:</i> <ul style="list-style-type: none"> • <i>Microscopy → LD bodies</i> • <i>Culture → promastigotes</i> 	- <i>Bone marrow aspiration:</i> <ul style="list-style-type: none"> • <i>Microscopy → LD bodies</i> • <i>Culture → promastigotes</i>

2. Amastigotes inside humans and promastigotes inside **sand flies (vector of disease)**

3. Trypanosomiasis cause 2 diseases *sleeping sickness* in Africa, and *Chagas disease* in Latin America

<i>Trypanosomiasis</i>	<i>Sleeping sickness</i>	<i>Chagas disease</i>
Pathogen	<i>Trypanosoma brucei:</i> <i>T. rhodesiense</i> and <i>T. gambiense</i>	<i>Trypanosoma cruzi</i>
Vector	<i>Tsetse fly</i>	<i>Reduviid (Triatomine) bugs</i>
Clinical presentation	- <i>Chancres (skin stage)</i> - <i>Lymphadenopathy (Winterbottom's stage)</i> - <i>Deep coma (CNS stage)</i>	- <i>Chagoma</i> - <i>Ocular lesion "Romana's sign"</i> - <i>Heart damage</i>
Diagnosis	- <i>lymph node aspiration</i> - <i>CSF aspiration</i>	- <i>Blood film</i> - <i>Serology</i>