Medical Committee
The University of Jordan

*The Skin and*
# MUSCULOSKELETAL
*System*

# MICROBIOLOGY

SLIDES ☐
SHEET ■
LECTURE # 3

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# Parasitology-2

• This sheet was written according to sec1 lecture, I also rearranged some repeated information here and there so plz don't be confused when referring to the original recording.

• also, this is an easy lecture, enjoy.

## Trypanosomatidae

There are two varieties of Trypanosomatidae (which are tissue parasites),

♦ Trypanosoma: this type affects the central nervous system, <you don't need to know much about it>.

♦ Leishmania: which mainly affects the skin, and is the one we're going to talk about,

Leishmania are dimorphic; they exist in two different morphologies, one is present in the primary host (the human being, and other animals like gerbils and dogs) and the other is in the intermediate host (sand fly), the reservoirs for this parasite are dogs and gerbil (الجربوع حيوان يشبه الفأر) as these can be affected. In fact not only those can transmit such parasite, in can be transmitted from human to human through sand fly, and also from animals to human through the same fly.

Leishmania are zoonosis.

Zoonosis is a disease that infects human beings, but at the same time there is an animal reservoir for it

Reservoir: is an animal or groups of animals that can harbor the parasite.

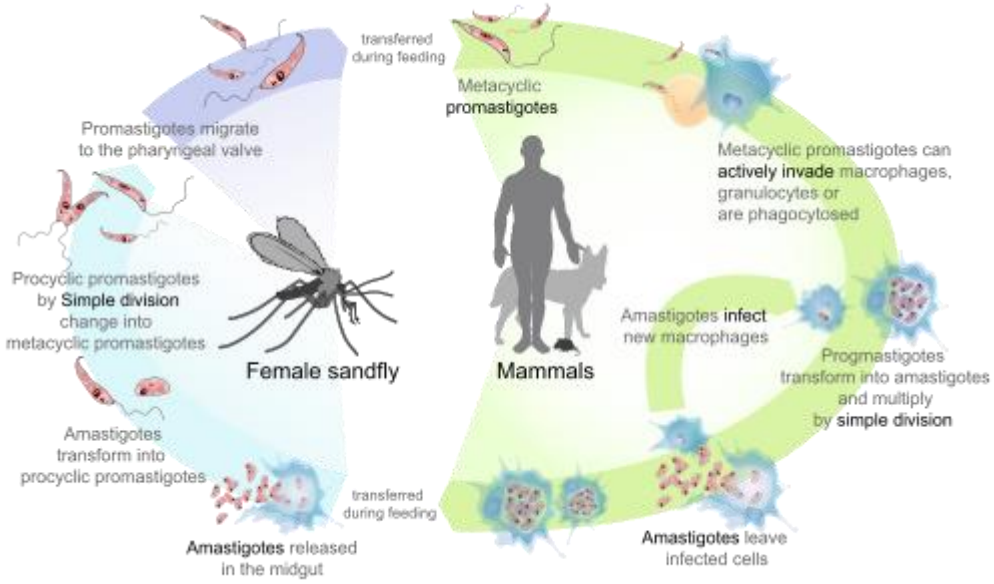
Keep in mind reservoir is not the intermediate host.

Now in the sand fly, it exist as a ***promastigote***; an elongated body that measures about 20 microns in length, it has a nucleus and an anterior flagellum (so they are flagellated parasites), in the base of the flagellum there is a kinetoplast which is made by DNA, RNA in the basal aspect of the flagellum.

In humans you can find them intracellular (inside the macrophages), they are rounded bodies measure about 3-4 microns in diameter, you can see the ***nucleus*** and a ***kinetoplast*** in its structure. Sometimes these bodies are called Leishman-**Donovan bodies**, because they've been described by a scientist called Charles Donovan.

When the fly bites the human, it injects those ***promastigote*** into the tissues, which in turn activate his complement system, an inflammation happens at the site of the lesion, this activation facilitates the entry of those nasty creatures into the macrophages; once

they are inside the macrophage they lose their flagella and then propagate themselves into the ***amastigote*** form, or as we call them *Donovan bodies*, check the figure below. While being inside the cell (the macrophages) they are resistant to the killing effect, they can persist for a long time; long time to replicate so it can infect other macrophages. They replicate so rapidly that they infect other macrophages and T-cells which come to the site of infection, an accumulation will occur at the site of the lesion; this accumulation will eventually transform into a granuloma and ulcers.




Back to the Leishmania, there are a variety of species which can be grouped into two main categories,

♦New World: •Leishmania mexicana •Leishmania braziliensis

•Leishmania utingensis • Leishmania chagasi

they are present in the new world, i.e. in central America and south and north America.

♦ Old World: •Leishmania aethiopica •Leishmania enrietti

• Leishmania major • Leishmania infantum

• Leishmania tropica

They are all identical morphologically, so it's quite difficult to differentiate between them from their morphological point of view, however, they attempt to produce different clinical diseases according to the species. There are -of course- other methods to distinguish between them, but usually they are done according to the geographical distribution between these parasites.

Four main diseases are caused by Leishmania, and we're going to discuss them all in detailed,

♦ Cutaneous Leishmaniasis

♦ Diffused Cutaneous Leishmaniasis.

♦ Mucocutaneous Leishmaniasis

♦Visceral Leishmaniasis

## ♦ Cutaneous Leishmaniasis:

Which is caused by ***L.tropica***, ***L.major, L. aethiopica*** and ***L.mexicana***, is characterized by a single lesion at the site of the bite, and this lesion begins to granulate to eventually be ulcerated, sometime it may be accompanied with exudates to form what is like a ***moist cutaneous leishmaniasis*** and other times, there is a dry lesion known as the ***dry cutaneous leishmaniasis***. This will go on after an incubation period which may reach up to three weeks, it will continue as a chronic ulcer that may last for few months to one year. As a treatment; it will heal by itself leaving a disfiguring, depigmented scar at the sites of injury, this action is known as the ***Baghdad boil or Aleppo boil or Bombay Boil,*** once it heals, the immunity becomes solid and you'll never get this disease again Insha'Allah.

But of course the immune response can vary between different individuals, this usually depends on the cell mediated immunity; immunity has two elements, one is cell mediated which is performed by cells and the other one is ***humoral*** which is mediated by antibodies, when it comes to Leishmaniasis, macrophages & T-lymphocytes are needed to eventually get rid of the infection.

Unfortunately some people <for some reason or another> you'll find the response is the humoral response, which will result with lots and lots of antibodies against Leishmania but very little T-cells and macrophages that are active against the disease, in this cases the lesion tends to spread from the site of lesion to other places on the skin by macrophages themselves, which will form what is known as ***diffuse Cutaneous Leishmaniasis.***

If you have cell mediated response or you have a humoral antibodies mediated response, the disease picture actually vary, now that what happens and mostly it's associated with Leishmania aethiopica, in Ethiopia, Kenya, etc.

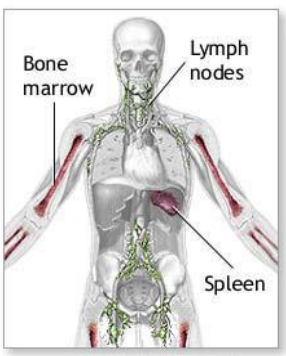
## ♦Mucocutaneous Leishmaniasis

It's caused by ***Leishmania braziliensis***, it begins with the small lesion, the patient doesn't worry about it, few months later reactivation of the disease happen, ulcers sadly appear in the mucous membranes of the nose and the oral and buccal mucosa, causing an intense ulceration and huge destruction of the tissues, this disease is a serious one, because it can be fatal; because what happened there (the secretions) can spread further to the pharynx and aspirate to the lungs and larynx, which leads to death if untreated.

## ♦Visceral Leishmaniasis

Which is caused by***; Leishmania donovani, Leishmania chagasi*** and ***Leishmania infantum***. This type is special that the other types mainly affect the skin and may reach to the membrane, this visceral type is a systemic disease that affects the body as a whole, and it is also believed that this type of Leishmania can survive core body's temperature, unlike other types which lives on the skin which has a lower temperature.





They also are resistance to the complementary system in the body, they infect the macrophages of the viscera which are present in large numbers in the lymph nodes, liver, spleen and bone morrow, so the patient get infected in these regions so it's a serious disease. Of course the mode of transition is the same, you get bitten by sand fly, the lesion will heal shortly and you'll forget about it, several months later you'll find out the viscera is involved; enlargement in the spleen and the liver, lymph and bone morrow and the patient suddenly will feel ill, he is malaise, raise in body's temperature because of fever, anorexia, weight loss and skin pigmentation; the skin turns out black, that's why it's called the black sickness (Kala Azar), he'll lose his appetite and eventually 90% will die within 2 years if left untreated.

Those were the main types for Leishmaniasis

The diagnosis is by taking biopsy from the cutaneous lesions if found looking for amastigotes in macrophages. In visceral Leishmaniasis, we use liver and spleen biopsies demonstrating these protozoa which is not a very good idea because bleeding may occur, you'll probably not find anything on the skin, so we take a biopsy from the bone morrow and you look for those amastigotes in the macrophages, also you can use serology; by detecting antibodies against Leishmania antigens, this is always positive in all the varieties of this disease, however, it's most useful in Visceral Leishmaniasis because it's usually more, and you don't see the lesion because it's hidden.

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**Unrelated subject the doctor forgot to mention in the last lecture,**

To diagnose a patient with Onchocerca volvulus, "which causes river blindness" you don't look for the microfilariae in the blood like loa loa and Wuchereria, a skin biopsy is taken, then the tissue is incubated in normal saline at room temperature over night to allow the microfilariae (larvae) to emerge. The microfilariae can then be identified microscopically.

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♦this is the intermediate host (sand fly), the doctor was describing the wings, they are orientated up a little bit and hairy.

Cutaneous Leishmaniasis occur on exposed area on the skin, mainly arms, nose.

•the doctor began to talk about some picture in his slides, about an enlarged liver and a man who has lost a lot of weight due to Visceral Leishmaniasis. Those pictures are from the web.

# Ectoparasites

As we all know, endoparasites are inside the body, ectoparasites are the ones which live on the skin or outside environment.

## Louse (plural: lice)القمل ,

There are three variety of this parasite,

• Head lice: which is involved with the scalp of the head,

• Body lice: which lives on the body

• Pubic lice: which lives in the pubic region it's also called Crab louse

The head and the body louse are similar in morphology between those three types the length ranges from 2 to 3 millimeters, 3 pairs of legs, each leg has a hook on the end of it so it can attaches to the clothes of the patients. They also can interbreed between each other. The Crab is smaller and may range for about 1.2 millimeter, but again it also has 3 pairs of legs.

Lice can be seen with the naked eyes. They feed on patient's blood whom may develop an allergic reaction against the saliva, symptoms are mainly severe itching, and constant scratching can cause a secondary infection by bacteria.

Their eggs are called nits السيبال, could be white, clear or black, are located on the hair shaft near to the scalp, those nits can be confused with Dandruffالقشرة. But of course the Dandruff are not attached to the hair unlike the nits, they fluoresce under UV light, so we can detect them,


♦**Head lice** are most commonly in school children, it has nothing to do with personal hygiene, and you can just take it from a child who carries it especially in winter months, girls more commonly than boys.

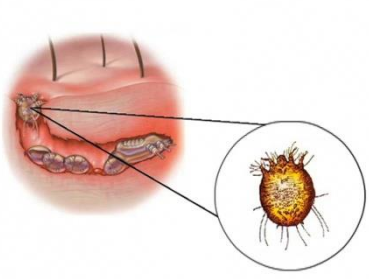
If you look behind the ear in that region you can find lice, fluorescent light will detect it, as far as head lice happen, it's not that serious disease, but still it's an unpleasant condition.

♦ **Body lice**, this has much to relate to personal hygiene, lucky you. Patients who don't change clothes or wash themselves they get infected, body lice lay eggs in the folding of the patients clothes, if you change your clothes you'll be at the safe side. More problematic, that is can transmit diseases by body lice, Borrelia recurrentis, spirochete that causes relapsing fever, also typhus by rickettsia...<not important to know>

♦ **Pubic lice** or **crabs**, are a sexually transmitted disease, can cause nothing but itching and may develop secondary infect by bacteria.

## Sarcoptes scabiei,الجرب

Scabies small insects (mite) that enters the skin, they don't suck blood instead they feed on the skin, producing tunnels, you can recognize those tunnels unless the patient was scratching them, then you'll only see scratching marks, makes the patient allergic to feces of the mite and released chemicals causing the itching. Children can get easy transmition, also it's sexually transmitted disease, and this disease prefers certain areas;



•between the fingers •the inner aspect of the wrest folds,

•axilla •inguinal region,

Usually the face is intact except in babies. It's not responsible to transmit disease to another.

The diagnosis is done by looking for these tunnels and picking up the insects from the black heads that are found in the ends of the tunnels, and look at it in the microscope.

## Bed bugs

They don't live on the body, however, they feed by sucking human's blood which will cause an allergic reaction due to their saliva, itching at the site of the bite happens. At the beginning you may confuse between them and the mosquito bites, but then you'll see that the inflammation is more than usual. They also bites in different places unlike mosquito bites.

Investigations into potential transmission of HIV, MRSA, hepatitis B, hepatitis C, and hepatitis E have not shown that bed bugs can cause this. (This piece of information was added by the sheet writer: However it might be possible that arboviruses are transmissible).

They live in the cracks of the house or the floor, hard to eradicate and very successful to move from one place to another, they don't transmit diseases but they have stink glands, so when you kill them you'll smell an awful smell, if you were planning to leave the house for a while to starve them, it's not an effective plan, that they can live for years without food, they will always wait for you ♥

Good luck in your midterms,

Mohanned Momani.