



University of Jordan
Faculty of Medicine



2018 2012
Medical Committee
The University of Jordan

Introduction to
Microbiology

Title :

Introduction to Parasites

Professor:

Dr. Hassan Abu Al-Ragheb

: 22

Slides

Handout

Sheet

Done by: Fareed Halteh



Price:

Designed by:
Wassem Kamal

M.D. University of Jordan
Class of 2018

f groups/Doctor2012
W http://medstudygroup.weebly.com

Definitions:

- 1) **Parasitology:** The study of parasites.
- 2) **Parasite:**(طفيلي) An organism that colonizes someone else. A parasite is somebody who uses somebody else for a living. A parasite has a negative effect.
- 3) **Symbiosis:** +/+ A relationship between two organisms in which both organisms benefit.
- 4) **Parasitism:** +/- A relationship between two organisms in which one organism benefits while the other suffers from damage.
- 5) **Commensalism:** 0/0 A relationship between two organisms in which both do not get affected.
- 6) **Primary host:** The organism that gets the parasitic disease. Most of the time, the patient is a human being; however, this is necessarily true. ANY ORGANISM that gets infected with the parasite is called a primary host.
- 7) **Intermediate host:** An organism that transmits the parasite to the primary host.
- 8) **Dead end host: An intermediate host that stops the life cycle of the parasite. The parasite cannot move from this host to the primary host.**
- 9) **Vector:** An insect that is an intermediate host. Ex. Malaria's intermediate host (mosquitoes)
- 10) **Reservoir:** an organism that can get the disease via the intermediate host. It can store the disease. It is considered as a type of primary hosts.
- 11) **Zoonosis:** An infectious disease that can affect humans and animals.
- 12) **Endoparasite:** A parasite that lives INSIDE your body; Ex. Malaria
- 13) **Ectoparasite:** A parasite that lives ON your body. Ex. Lice, bed bugs, and scabies.

Notes:

- There are four groups of infectious organisms:
 - Parasites
 - Fungi
 - Bacteria
 - Viruses
- The term parasite includes the organisms that can divide and grow under different conditions. They can exist in two different species. They have complicated life cycles.

Moreover, they have different properties at different stages of life. Their properties change as they go through different stages of life.

- Parasites are very versatile. They can adapt and grow under certain conditions. For example, a parasite might develop in the lungs before being able to move to a different place in the body.
- Unlike bacteria, parasites have a complicated life cycle.
- When we talk about parasitic diseases, we refer to the patient as a host (the primary host)
- Depending on the host, parasites go through different stages.
- Before infecting the primary host, sometimes, parasites have to go through an intermediate organism. This organism is called an intermediate host. This makes their life cycle complicated.
- **Are parasitic diseases important?**
 - People are usually interested in viruses and bacteria. However, parasitic diseases are very important. They spread mostly in the developing world. This can be attributed to low levels of hygiene, low living standards (this makes combating diseases a harder task to accomplish), and the hot and wet climate. This sort of climate encourages the growth of parasites. Parasitic diseases affect many people; and they are as important as other diseases. In the developed world parasites are not that important. As far as we are concerned (Jordan), we are in between. We have some parasitic diseases around the country, but it is very unlikely for us, as physicians, to encounter any cases during our careers.

- Parasitic diseases are the second most common cause of infection related blindness. The most common cause of infection related blindness is *Clamydia Trachomatis*. *Clamydia Trachomatis* is the bacteria responsible for the disease called river blindness.
- One billion people of the world's population have nematodes (ديدان). Nematodes are a type of parasites.
- Bilharzia is very common in Egypt and Southeast Asia. We don't have it here in Jordan. There are about 300 million cases around the world per annum.
- Filariasis is a parasitic disease cause by nematodes. It affects about 300 million people every year. Filariasis is an accumulation of nematodes inside the tissues of the body.
- Malaria is a widespread parasitic disease. It affects 0.5 billion people annually. The mortality rate due to Malaria is relatively low (one to two million). In Jordan, we had Malaria in the 50's, but we do not have malaria any more.
- A human being can be an intermediate host.
 - In the case of Toxoplasmosis (infection cause by *Toxoplasma gondii*), humans might act as intermediate host. Those who like to interact with cats might get the parasite via cysts. *Toxoplasma gondii* is a parasite whose primary host is a cat.

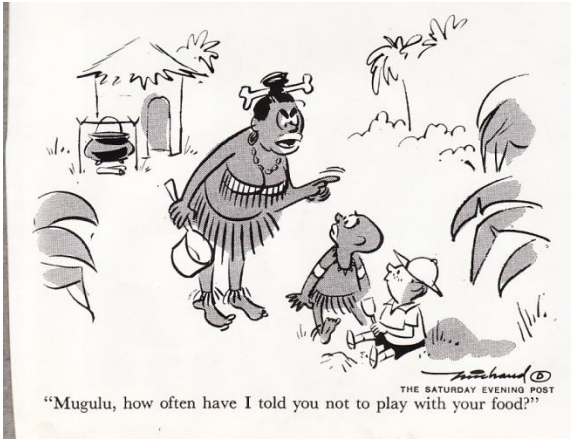
The intermediate host is a mouse or a rat. The cyst of this *Toxoplasma* can be passed down through the feces of the cat. If a mouse eats the feces, then it becomes an intermediate host. After that, a cat eats the mouse and the cycle repeats.

▪ **Where do we fit in this picture? (as weird as the answer seems, this is what the Dr. said)**

- If you eat these feces or something that was contaminated with the feces of the cat, you will become an intermediate host of the disease. Usually, when human beings become intermediate hosts, the parasite's life cycle stops there. It is very unlikely that a cat can eat a human being, unless the cat is a very big one (aka lions or tigers). In this case, we call the human being a dead-end host.



- **What if a mouse eats the feces of a human being?**
 - As an intermediate host, the *Toxoplasma*, is in the intestines. The cysts are not passed down through the feces. The cysts are formed in the tissues. You need to eat the flesh of the human being in order to get the infection. Intermediate hosts are usually animals; however, humans can become intermediate hosts (but it is usually accidental)
- You don't always have to have an intermediate host. The passage from one primary host to the other can be direct.
- We have to be able to differentiate between the transmission of a bacteria through a vector and the transmission of a parasite through a vector. In the case of bacteria the vector (Ex. Lice) only acts as a carrier; however, in the case of a parasite, the parasite develops inside the vector.
- Occasionally, the same animal might serve as a primary and an intermediate host. The parasite might go through the stages of development in different body parts of the animal (starting in the guts and ending in the tissues). Two cycles happen in the same host. The disease transmits itself from the intestines of the animal to its guts.



- **How can this sort of parasite be transmitted from one host to the other?**

- **Cannibalism!!** When the organism is both an intermediate and a primary host, the only way for the disease to be transmitted within the members of the same species is through cannibalistic behaviors. This is why we rarely see these parasites in humans.

- **Reservoir:** if we're talking about malaria, the intermediate host is a mosquito and the primary host is a human being. Both are affected; but the parasite develops (divides and matures) in both the intermediate and the

primary host. **Baghdad's boil/Aleppo's boil** is a disease in which there is a sore over a certain area of the body. This disease is very common in Aleppo and Baghdad, hence the name. This sore persists for about a year. After that, it heals leaving a scar behind it. Here, they primary host is the human being. The intermediate host is a fly; the sand fly. We have other animals that might carry this disease like dogs and rodent. They can be affected just like humans. The disease can be transmitted from the human to these species via the sand fly.

- **What do we call these species that can harbor the disease?**
 - We call them reservoirs. The parasite can be stored in these animals. A reservoir is not an intermediate host. It is a primary host.
- **Zoonosis:** a disease that can affect both human beings and animals. Brucella is a zoonotic bacterium. It causes Maltese fever. This fever usually affects cows; however, it can be transmitted through milk. This is why we should not drink unpasteurized dairy products. Baghdad's boil is considered as a zoonosis as well.
- Parasites can be assigned descriptive names according to the place they reside in. A parasite that resides in a lumen of an organ can be called a luminal parasite. Parasites that live in your GIT (gastrointestinal tract) are luminal parasites. There are some parasites that invade your tissues. These are called tissue parasites. For example, malaria is a tissue parasite; it infects blood, liver, etc...
- Sometimes the parasite can be both, a luminal and a tissue parasite. Amoeba is a good example of this type of parasites. Amoeba can live in the lumen of the large intestines (causing diarrhea), but they can penetrate the walls of the intestines and reach the liver (forms an abscess).
- **Life cycle:**
 - Direct spread: (there is no need for an intermediate) → can occur through several intermediate structures like eggs, cysts, and very rarely the parasite itself goes to the organism. The parasite is usually very delicate. If it comes out of the body, it dies. This is why parasites tend to resort to eggs or cysts for transmitting the

disease. There is one known parasite called *Trichomonas vaginalis*: this is the only case in which the parasite itself moves from one host to the other.

- Spread through the intermediate host: primary host → intermediate host → primary host. In some cases, parasites go through two intermediate hosts; however, this is very rare.