MED437
KING SAUD UNIVERSITY

MICROBIOLOGY
437

Microbiology – Lecture 5
Introduction to Parasitology

TEAM 437

Red: important
Green : doctor notes
Black : original slides
Grey: extra information

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Objectives

1. Define common terms describing host-parasite relationship.

2. Outline the broad classification of parasites.

3. Name examples of protozoan parasites.

4. Describe the life-cycle of Giardia lamblia as an example of intestinal protozoa.

5. Describe the main stages of the life-cycle of Plasmodium as an example of blood and tissue protozoa

Infection

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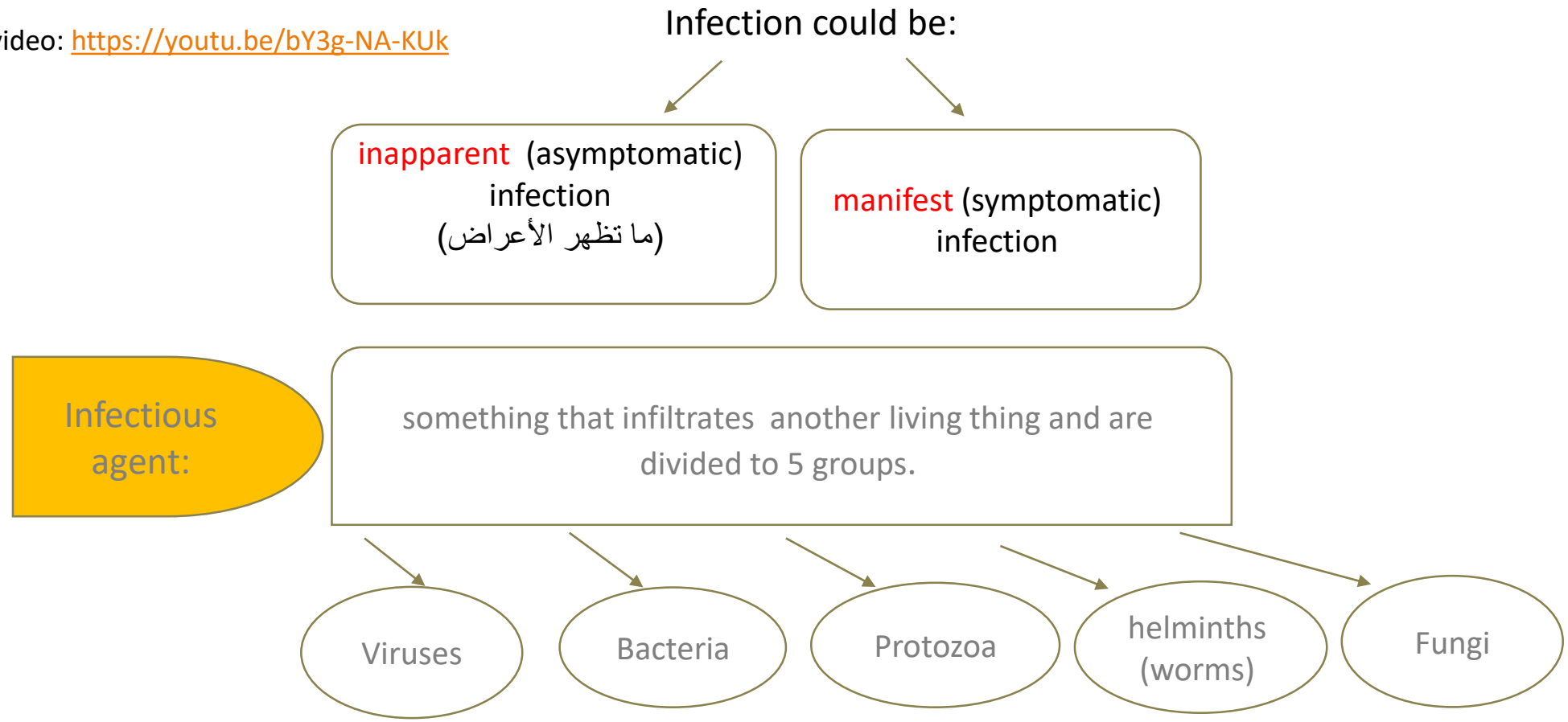
The entry , development and multiplication of an infectious agent in the body of humans or animals.

Useful video: https://youtu.be/bY3g-NA-KUk



Definitions

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Pathogenesis: Production and development of disease.

pathogenicity: Capability of an infectious agent to cause disease in a susceptible host.

Host: A human or animal which harbors an infectious agent under natural conditions

- **Definitive host** (primary host): A host in which the parasite passes its sexual stage
- **Intermediate host** (secondary host): A host in which the parasite passes its larval or asexual stages.

Definitions

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Carrier:	**Parasitism:**	**commensalism:**
A person or animal that harbors a specific infectious agent in the absence of symptoms and signs of a disease and serves as a potential source of infection.	– A relationship in which an organism (the infectious agent, the parasite) benefits the association with another organism (the host) whereas the host is harmed in some way. Example: ○ Fleas or ticks that live on dogs and cats are parasites. They are living off of the blood of the host animal. 	Kind of relationship in which one organism ,the commensal is benefited whereas,the host is not harmed or even helped. Example: ○ Barnacles are a type of crustacean that attach to whales. Barnacles cannot move on their own, so they use the whale to move around and find locations with food. 

Definitions

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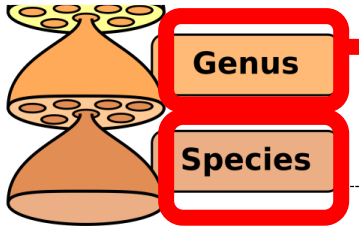
Scientific names of parasites follow Zoological Classification:



Helminths

- Round worms (Nematodes)
- Flat worms:
- 1/Trematode
  2/Cestodes

Protozoa

- Amoebae
- Flagellates
- Ciliates
- Apicomplexa

المطلوبين فقط (اللي بالأحمر)

Ectoparasite: **parasite that lives on the outer surface of its host.**

Example: Human flea

Endoparasite **Parasite that lives inside its host.**

Example: Hook worm

zoonosis: **Disease of animals that is transmissible to humans .**

Protozoa

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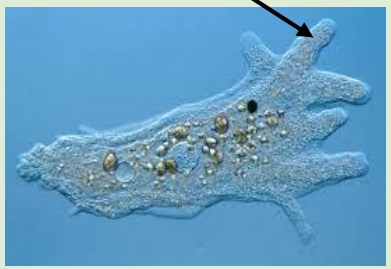
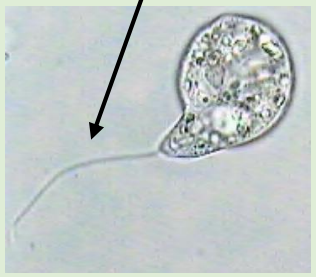
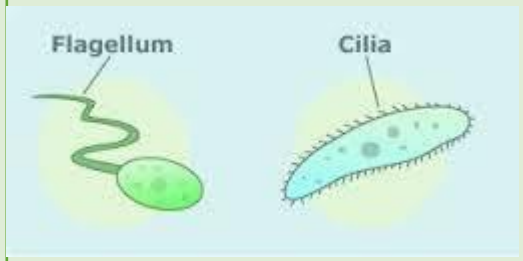
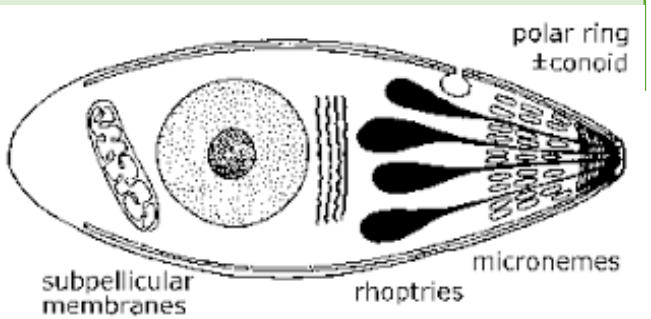
They are unicellular with a single cell for all functions and they are divided to 4 genus:

➢ **Amoebae:**	**Flagellates:**	**Ciliates:**	**Apicomplexa (Sporozoa):**
➢ reproduces asexually by mitosis and cytokinesis. ➢ Amoeba move and feed by extending temporary structures called pseudopodia 	➢ A flagellate is a cell or organism with one or more whip-like organelles called flagella. ➢ They move by flagella 	➢ Move by cillia ➢ common almost everywhere there is water ➢ reproduce asexually, by various kinds of fission. 	➢ tissue parasites, Apicomplexans have a unique gliding capability which enables them to cross through tissues and enter and leave their host cells. This gliding ability is made possible by the use of adhesions and small static myosin motors. ➢ The Apicomplexa are unicellular and spore-forming 

Helminths

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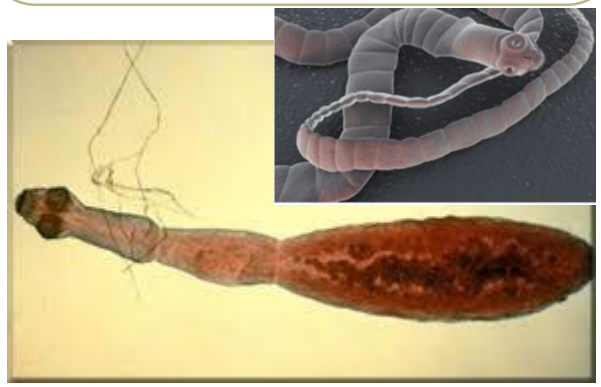
They are multicellular with specialized cells

Round worms (Nematodes):
elongated, cylindrical, unsegmented.

Flatworms:

Trematodes:
leaf-like, unsegmented.
غير مخططه

Cestodes:
tape-like, segmented.
يعني مخططه



Parasitic Protozoa

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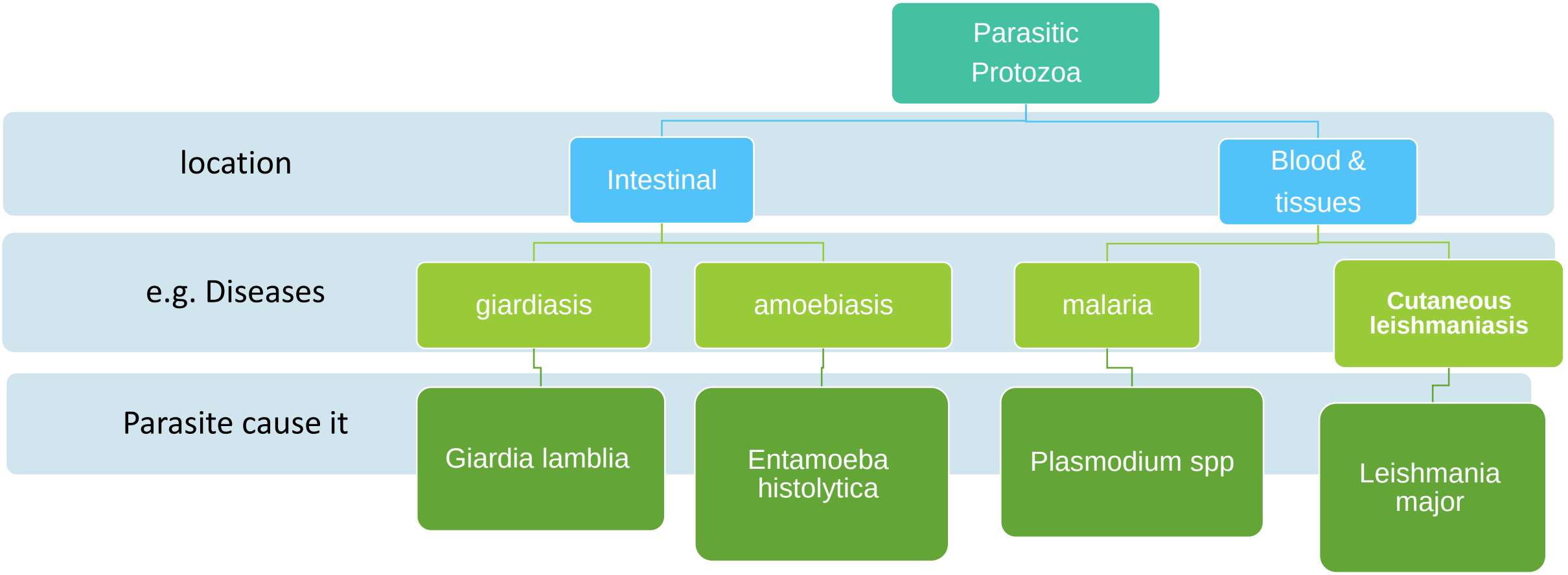

Giardia lamblia (THE PARASITE)
giardiasis (THE DISEASE)

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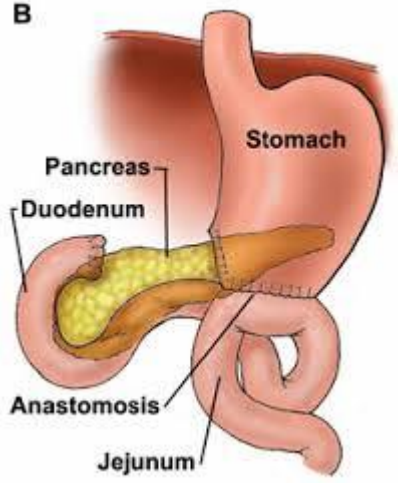


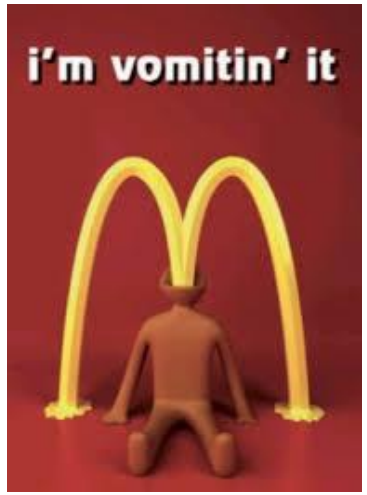
Giardia lamblia

infects

I. *Duodenum*
II. Jejunum

Can cause

I. *Diarrhea with poor absorption of nutrients*
II. loss of appetite
III. *Stomach cramp*
IV. *Vomiting*



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life-cycle of Giardia lamblia

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*only the cyst is infectious
*Both cysts and trophozoites exit the body
Excystation----> stomach*
*encystation---> small intestine
*As few as 10 cysts can cause infection
→ means: high pathogenicity.

1- cysts are ingested by consuming contaminated food or water, or fecal-orally.

2- the low pH of the stomach ,the acidity produces excystation (Excystation means the releases of trophozoites.)

3- Within the small **intestine** (**duodenum**,**jejunum**), the trophozoites reproduce asexually (binary fission) and either float free or are attached to the mucosa of the lumen.

4- Some trophozoites then encyst in the small intestine (encyst = become cyst).

5- Both cysts and trophozoites are then passed in the feces **(but only the cyst is infectious)**

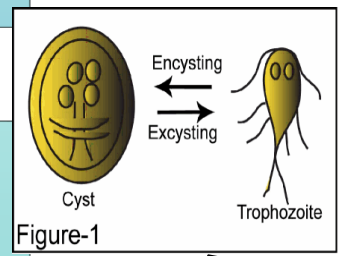


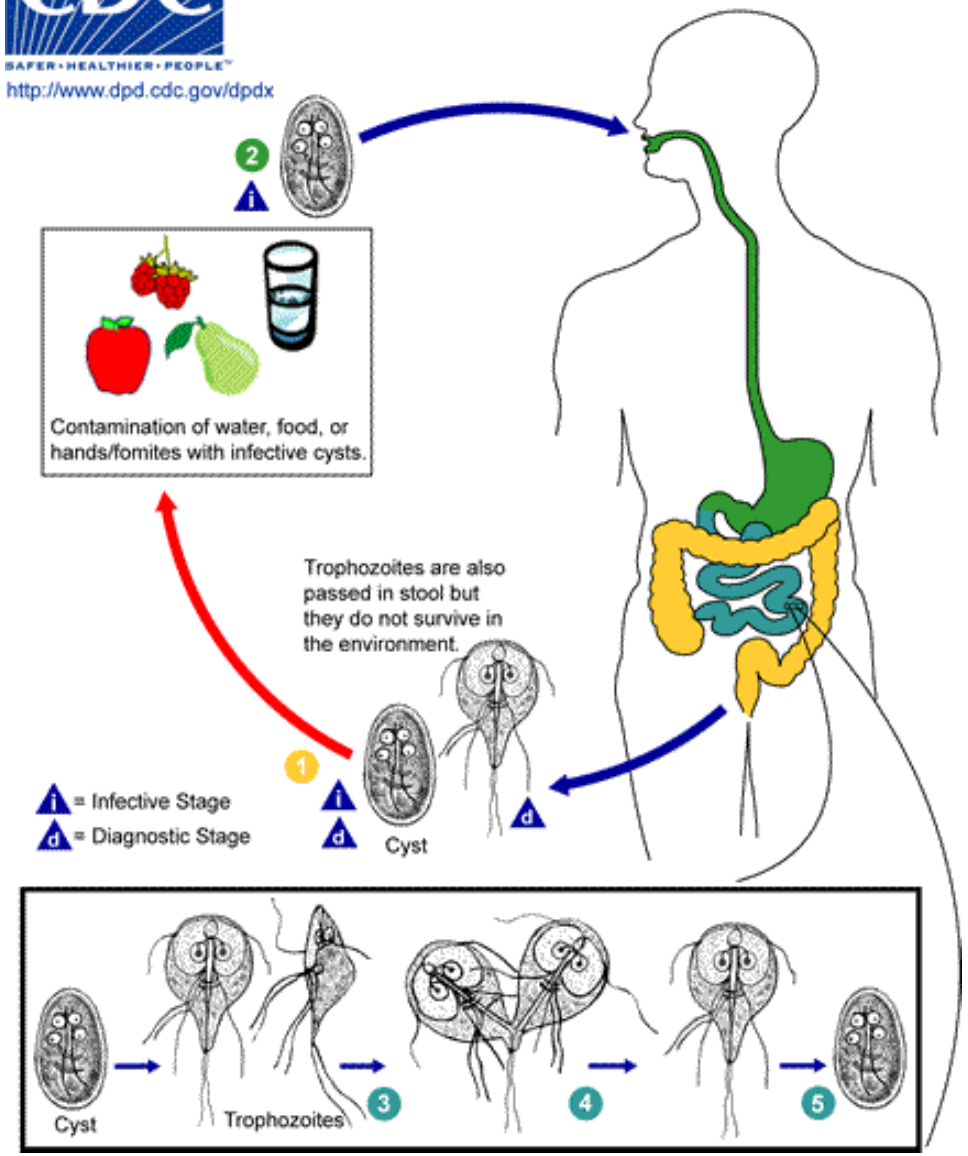
Figure-1

They can survive outside the body for several months, and are also relatively resistant to chlorination, UV exposure and freezing.

As few as *10 cysts* can cause infection

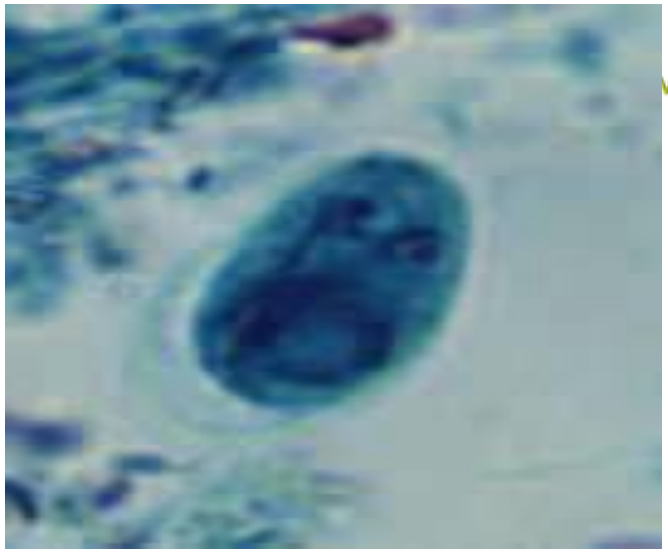
Each cyst produce two trophozoites

Giardia cysts are the infective stage of Gastro intestinalis.



Person-to-person transmission is possible, Animals can also be infected with Giardia .

Giardia **cyst (infective stage has 4 nuclei)**



Giardia **trophozoite (Mature Giardia has 2 nuclei)**

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Plasmodium spp (THE PARASITE)
Malaria (THE DISEASE)

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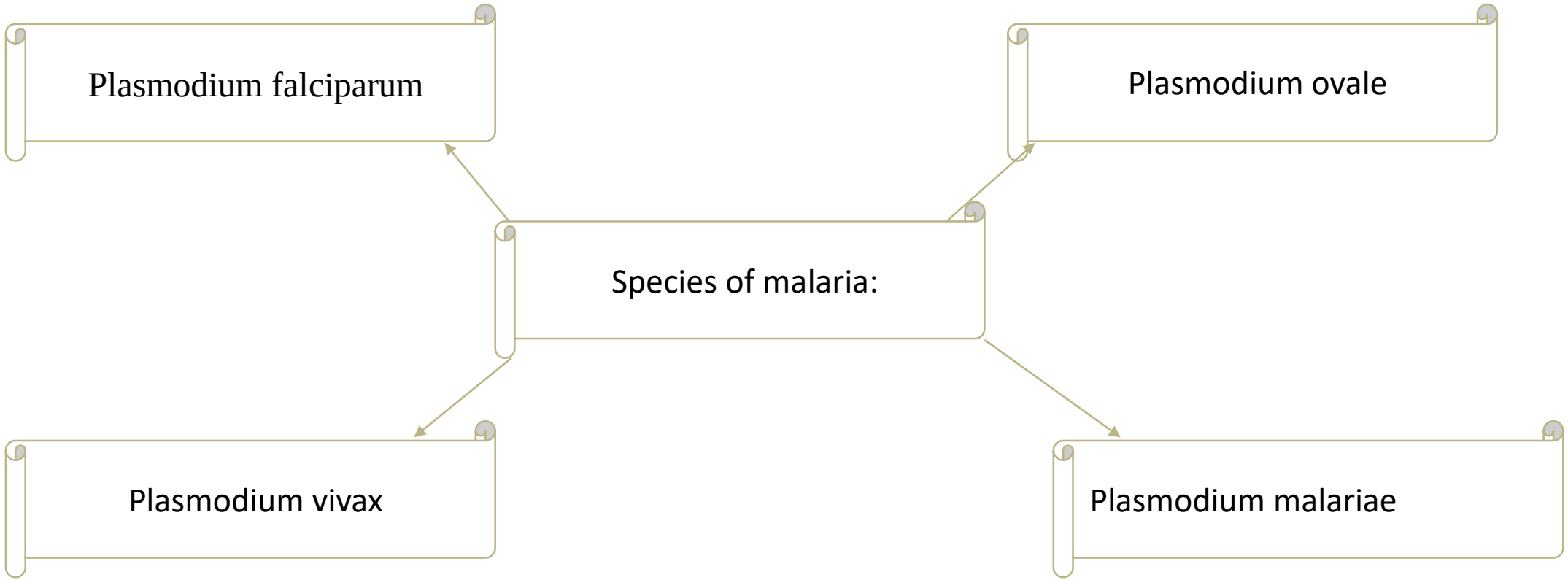

LIFE CYCLE OF MALARIA

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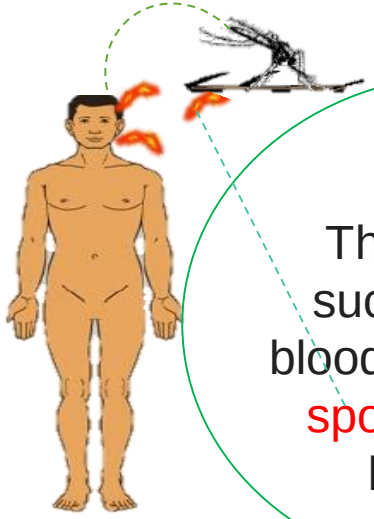
A mosquito (anopheles) carrying plasmodium



Healthy human

1
The mosquito sucks human's blood and give him sporozoits from her saliva

2
The sporozoits enter the body blood → liver

3
Multiplication in the liver

(**merozoites**) **Comes out of the liver To the RBC'S (red blood cells) Then replication in the cells. then it will burst**

This will lead to severe anemia

merozoites

Become gametocytes : male and female

Transmit to a healthy mosquito (when it's sucks blood from a carrier human)

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LIFE CYCLE OF MALARIA

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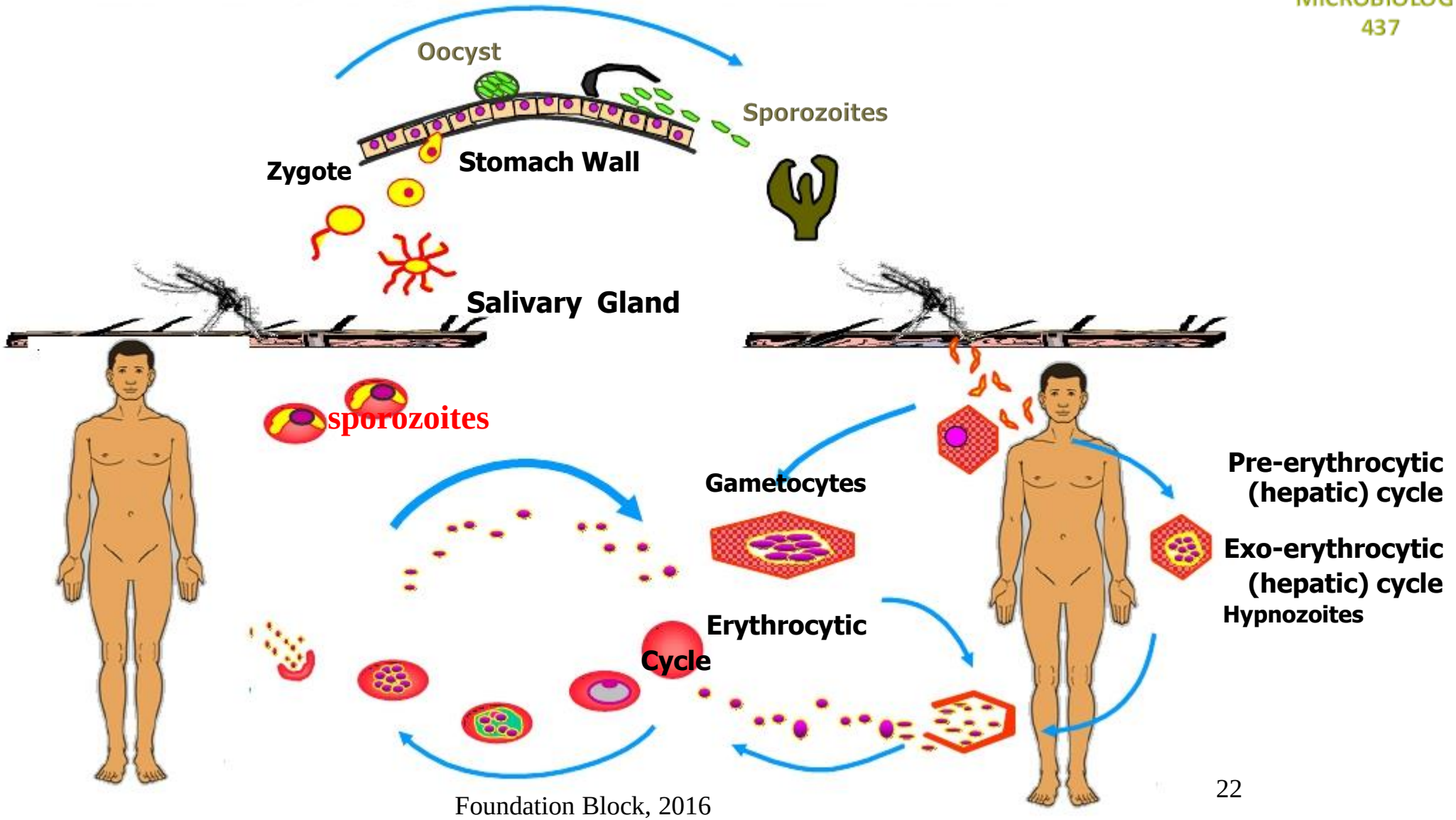

Cont.

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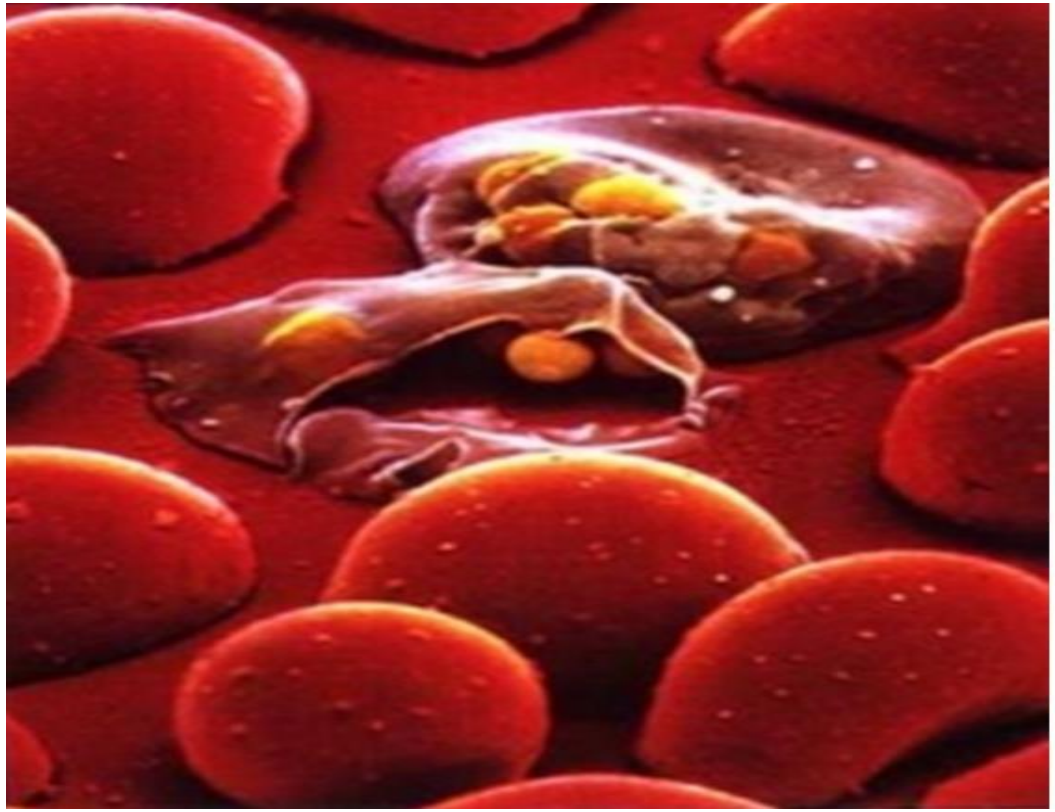
Key information:

- sporozoites = infective stage
- Main pathogenic is in the RBC
- The replication in the liver
- After reproducing inside hepatic cell they attack RBC's and reproduce till it bursts (the RBC's)
- Mosquito is primary (definitive) host (sexual)
- Human is secondary (intermediate) host: (asexual)
- Only female anopheles can causes infection because males can not reach the blood
- The fertilization happens inside the mosquito between male and female gametocytes = sporozoites
- Some of them get in hypnozoites stay for a while then, they get active again and reproduce

* hypnozoites تعني الفترة الكامنة

* anopheles الذبابة التي تنقل المرض



Main pathology of malaria is due to invasion of the RBCs.

Malaria parasites inside red blood cells

Leishmania major (THE PARASITE)
Cutaneous leishmaniasis (THE DISEASE)

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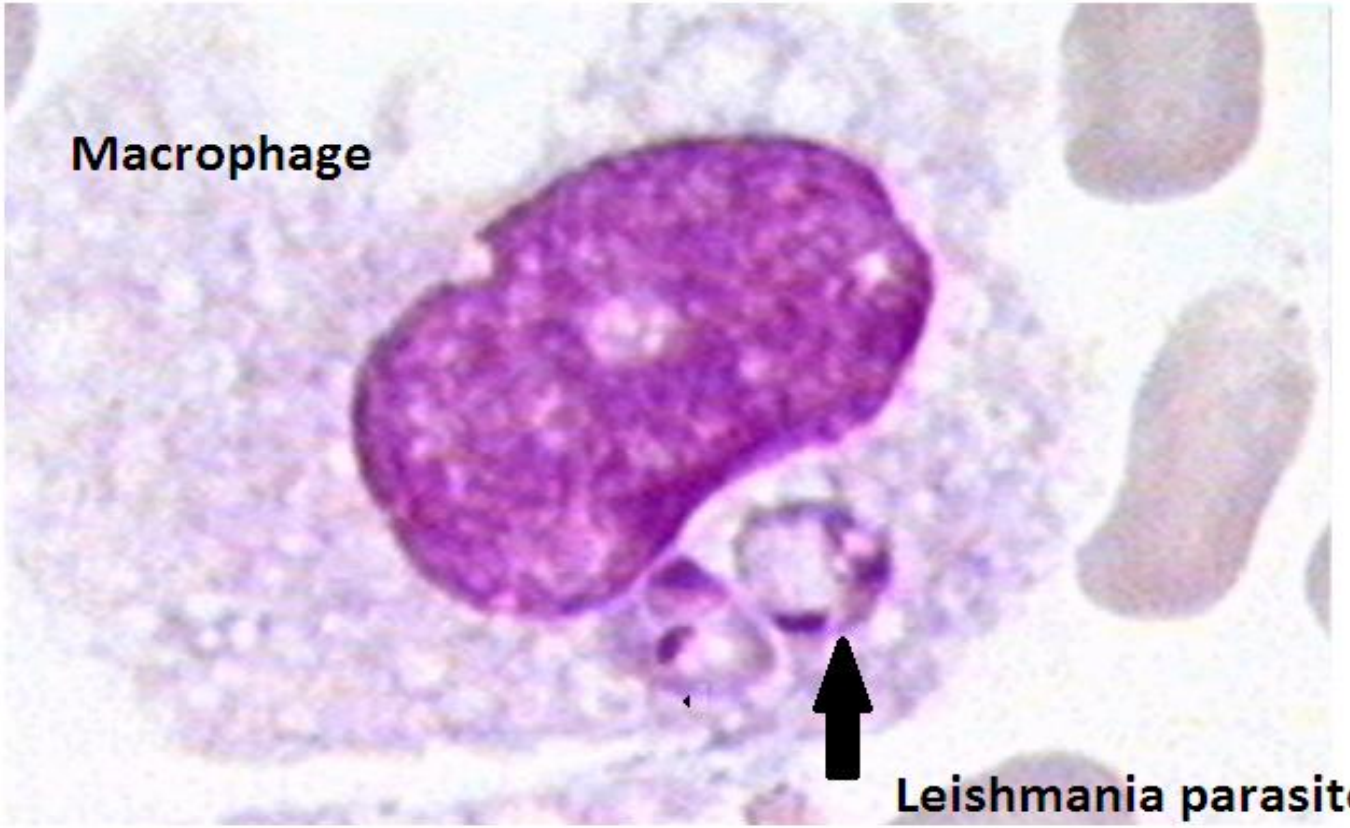
- Leishmanial major is skin disease causes lesions.
- Parasite has 2 parts inside the host. Amastigote in human body and promastigote in sand fly body.
- When it gets to human body with promastigote it gets phagocytotic by macrophage, then inside the macrophage's body it turns into amastigote.



Cutaneous leishmaniasis is caused by Leishmanial major

Life cycle of Leishmanial major

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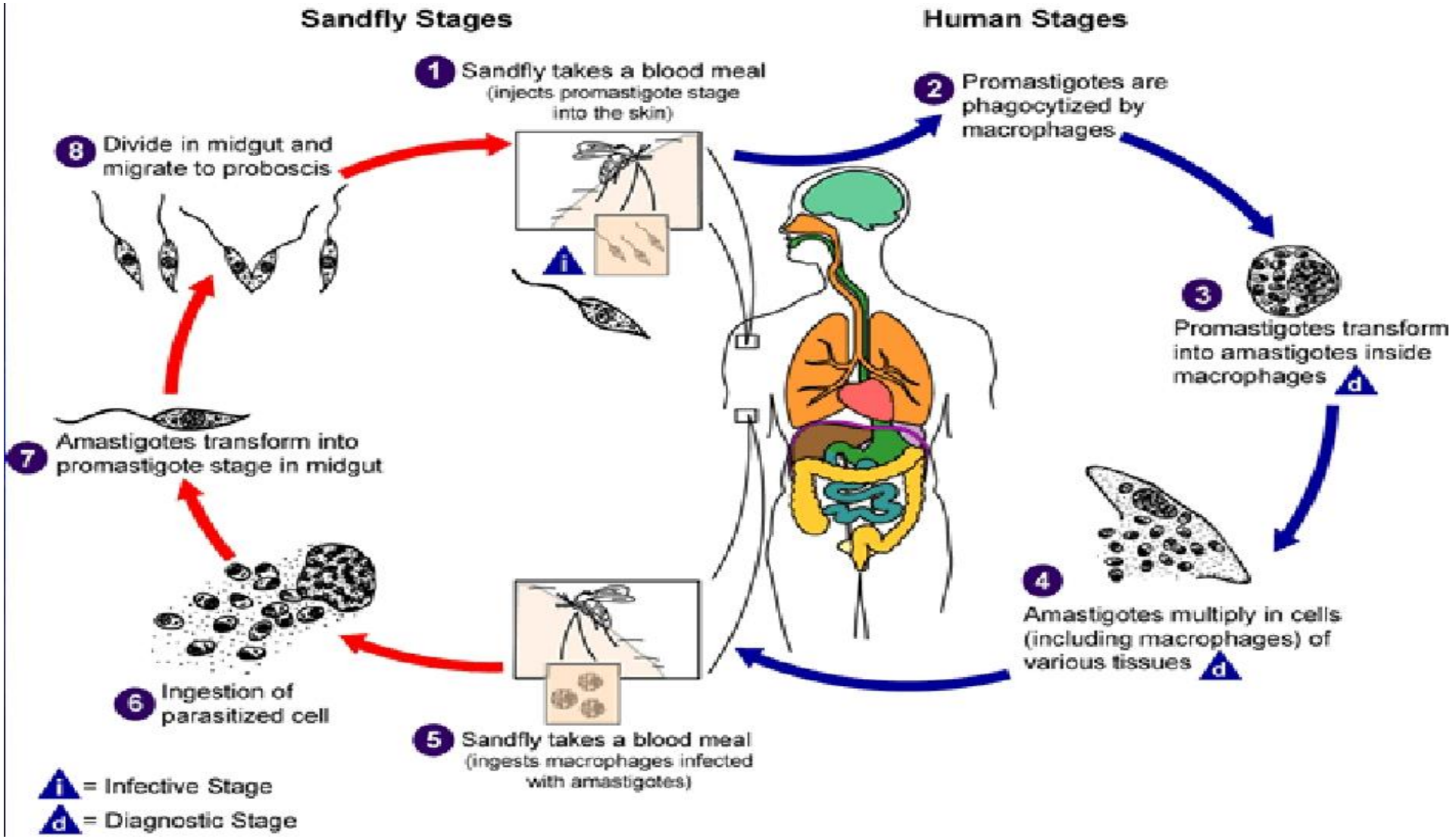

Questions

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1- An example of a malaria specie is?

a) *Entamoeba histolytica* *b)Giardia lamblia* *c)*Plasmodium falciparum d)Amoebae

2- The type of relationship in which the host is unharmed?

a) Commensalism b) Parasitism c) Neutralism d) Infection

3- What causes giardiasis?

a)Giardia histolytica b)*Entamoeba histolytica* c)Giardia lambilla d)Malaria

4- The trophozoites reproduce asexually within?

a) Stomach b)Liver c) Small Intestine d)Pancreas

5-A parasite that lives inside its host is called?

a) Ectoparasite b) Definitive Host c) Zoonosis d) Endoparasite

6- Refers to the capability of an infectious agent to cause disease in a susceptible host?

a) Pathogenesis b)Aetiology c) Pathogenicity d)Infection

7- Excystation means the release of trophozoites

a) True b) False

1-C 2-A 3-C 4-C 5-D 6-C 7-A

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