

**Microbiology**

team 436



**MEDICINE**  
KING SAUD UNIVERSITY

# MICROBIOLOGY

## **Lecture : Classifications of parasites and protozoa**

**IMPORTANT.**  
DOCTORS NOTES.  
EXTRA INFORMATION.

# OBJECTIVES

1. **Define** common **terms** describing host-parasite relationship.(3-5)
2. Outline the broad **classification** of parasites.(6+9)
3. **Name examples** of protozoan parasites.(9)
4. Describe the life-cycle of **Giardia lamblia** as an example of **intestinal** protozoa.(10-12)
5. Describe the main stages of the life-cycle of **Plasmodium** as an **example** of **blood** and tissue protozoa. (13-16)

# DEFINITIONS:

## Infection

The entry , development and multiplication of an **infectious agent** in the body of humans or animals. The result may be:

**Inapparent**  
( asymptomatic) infection  
(ماتظهر الأعراض)

**Manifest**  
(symptomatic) *infection*

العوامل التي تحدد هل بيصير فيه انفكشن أو لا هي إذا كان فيه receptors عند المريض أو على حسب كمية الباراسايت التي دخلت ممكن تصير قليلة ولا تسبب انفكشن.

## Host:

A human or animal which harbors (تستضيف) 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**.

## carrier:

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**

# Definition

## Pathogenesis

Production and development of disease.

## Pathogenicity

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

Note..  
Pathogenicity  
قدرة العامل المعدي  
على إنتاج المرض

## Commensalism

تكافل

Kind of relationship in which one **organism** (مثال النورمال فلورا) , the commensal , is **benefited** whereas t , **the host** , is **not harmed** but **or** even **helped** by this association.

## Parasitism

(تطفل)

A relationship in which an organism (the **infectious agent**, the parasite) **benefits** from the association with another organism (**the host**) whereas the host is **harmed** in some way.

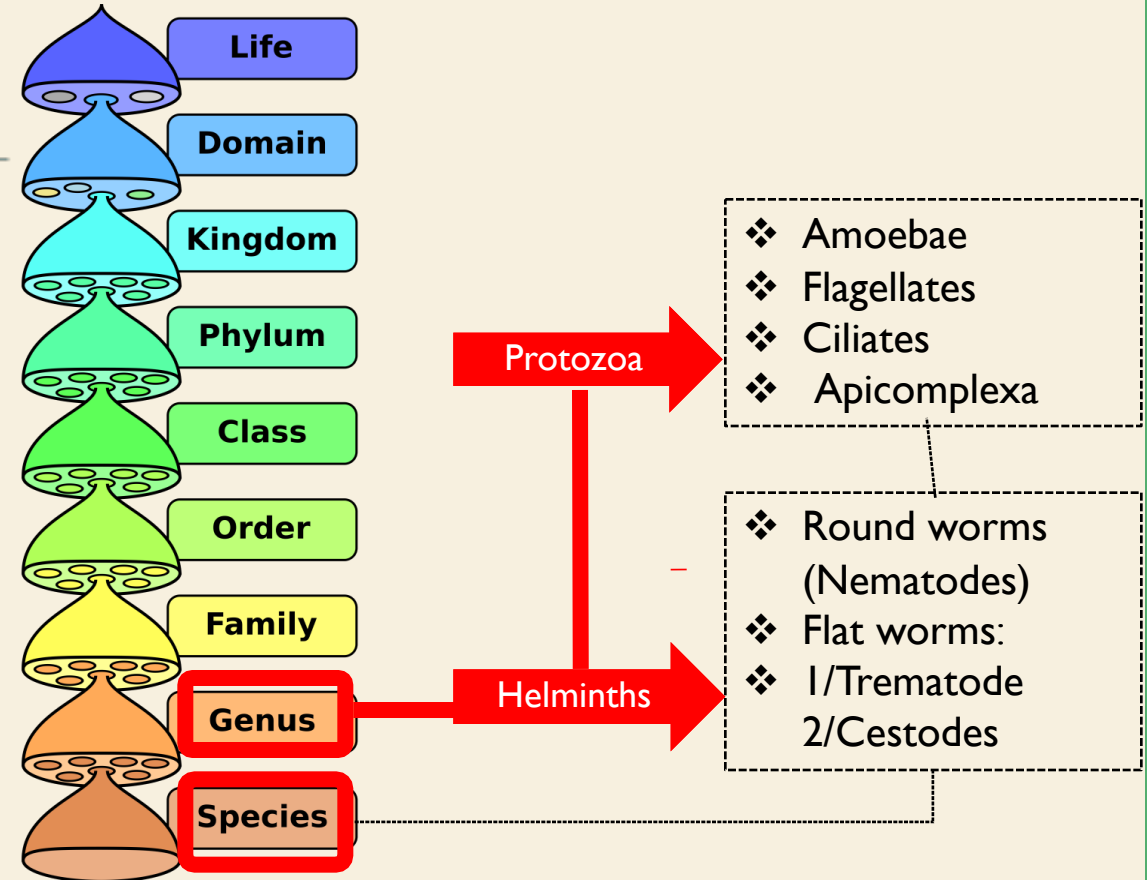
# Definitions

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

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

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

## Scientific names of parasites follow Zoological Classification:



اخر تصنيفين هم المطلوبين فقط (اللي بالأحمر)

# Classification of Parasites

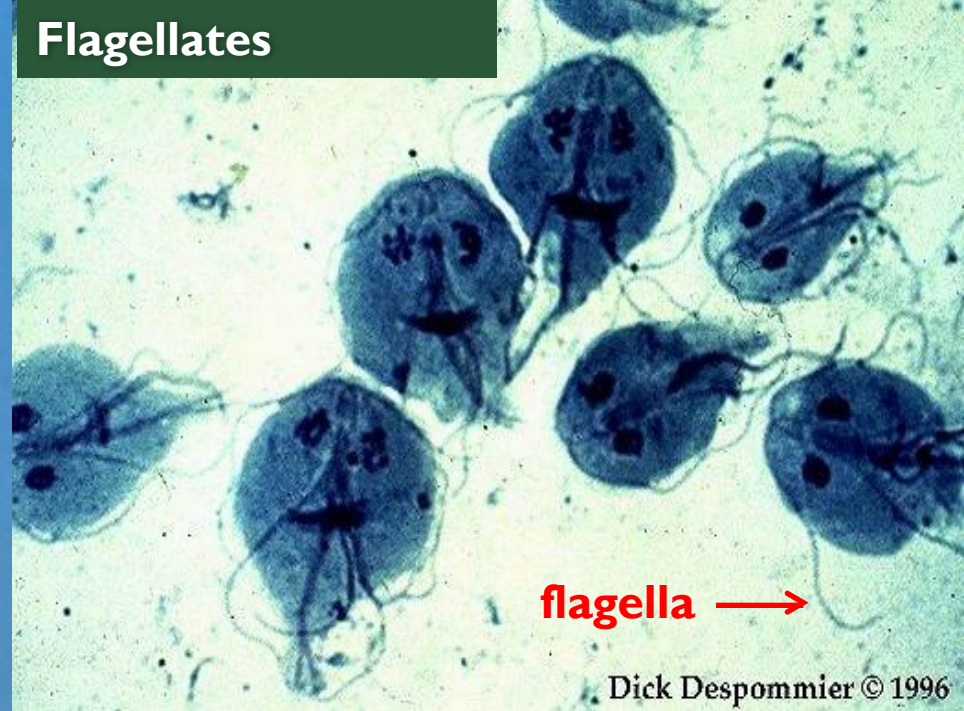
PROTOZOA	HELMINTHS
- <b>Unicellular</b> (Single cell for <b>all</b> functions).	- <b>Multicellular</b> ( <b>Specialized</b> cells).
<b>Amoebae</b> (move by pseudopodia أقدام كاذبة). <b>Flagellates</b> (move by flagella). <b>Ciliates</b> (move by cilia). <b>Apicomplexa</b> (Sporozoa) tissue parasites.	<b>Round worms(Nematodes):</b> - elongated - cylindrical, - unsegmented (قطعة واحدة) <b>Flat worms :</b> - Trematodes: <b>leaf-like</b> , unsegmented. (جسم واحد كالورقة غير مفصلة) - Cestodes: <b>tape-like</b> , segmented(شريطي مفصل)



## Amoebae



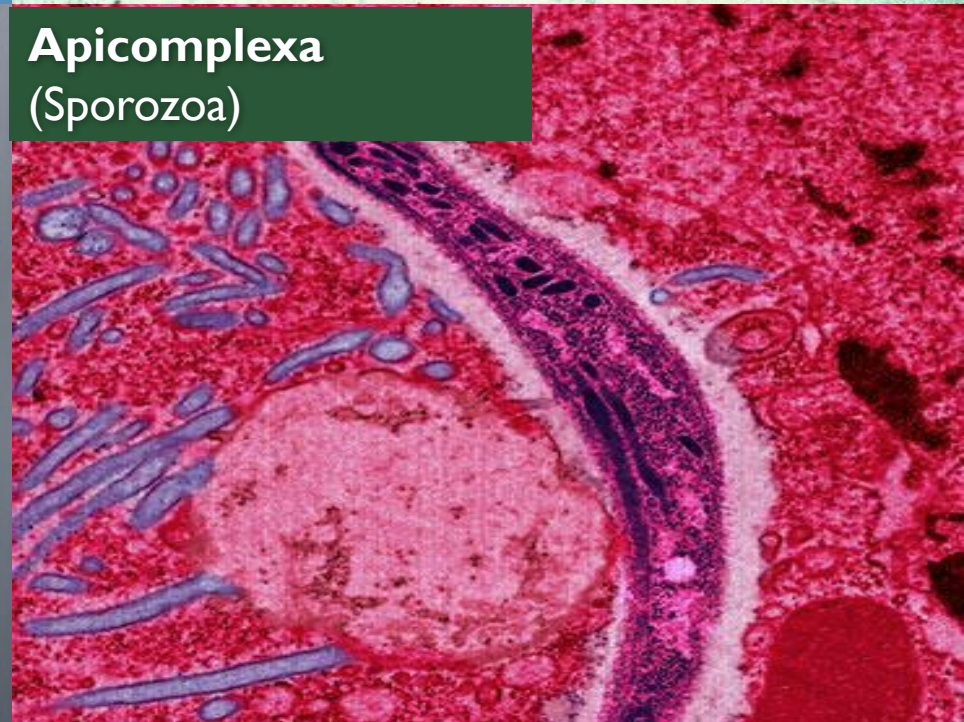
## Flagellates



## Ciliates



## Apicomplexa (Sporozoa)





## Nematodes



## Trematodes

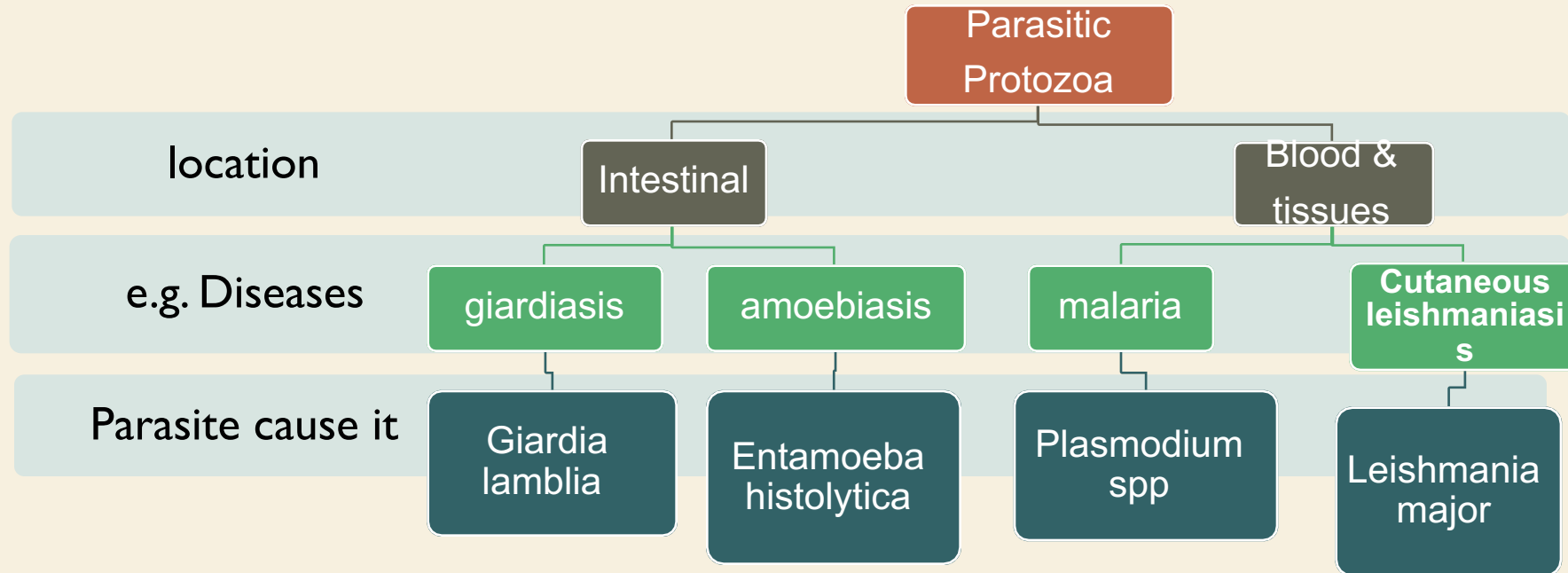


## Cestodes



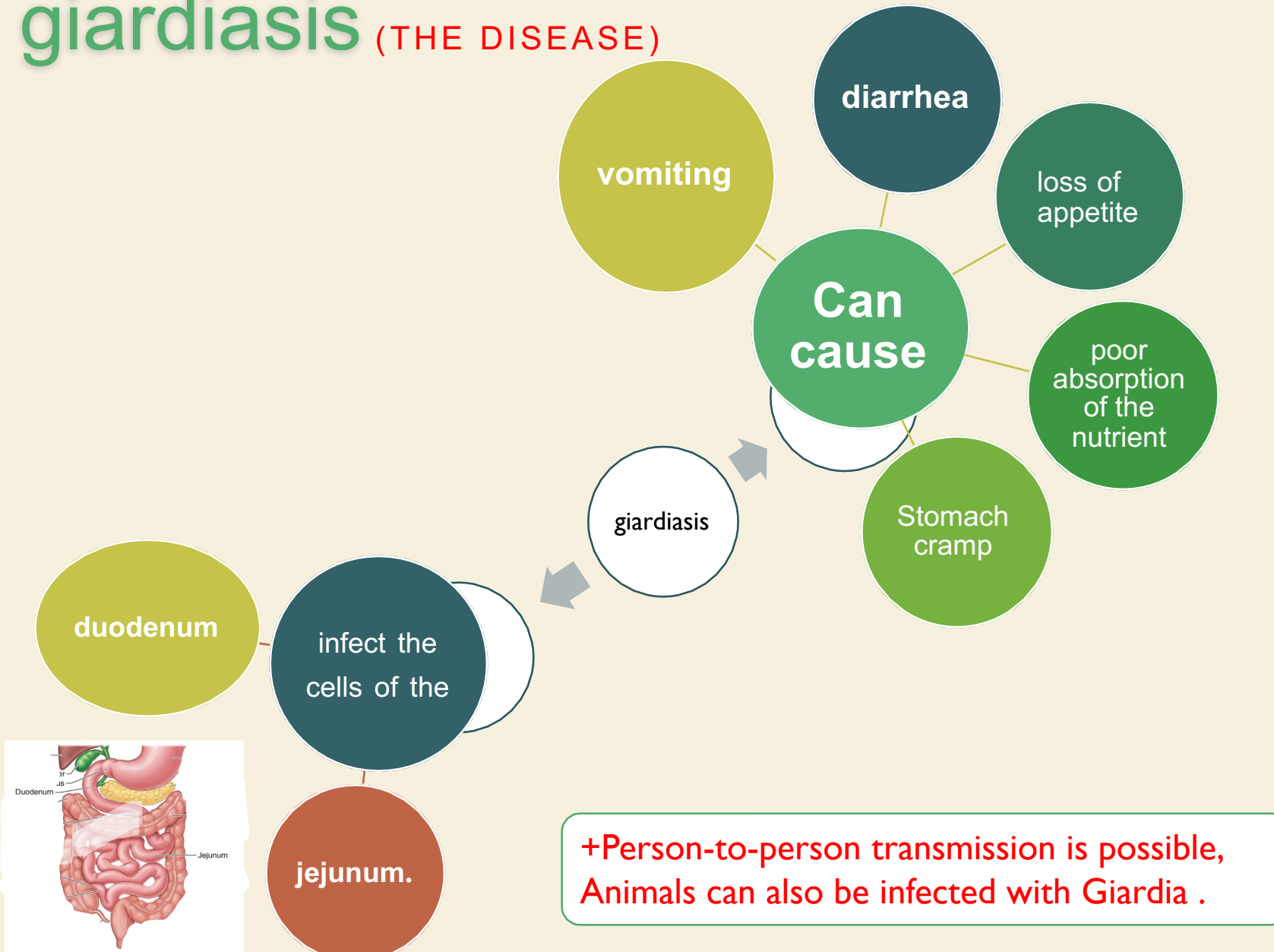


# Parasitic Protozoa



# Giardia lamblia (THE PARASITE)

## giardiasis (THE DISEASE)



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

# LIFE-CYCLE OF GIARDIA LAMBLIA

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

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.

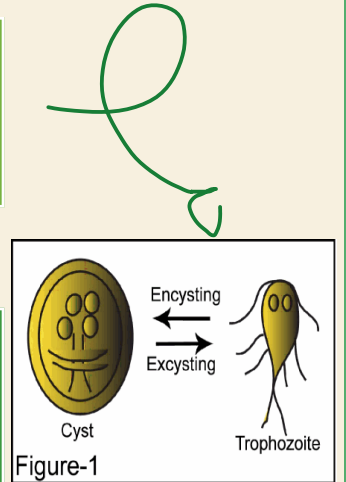
1- cysts are ingested by consuming **contaminated food** or **water**, or fecal-orally.

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).

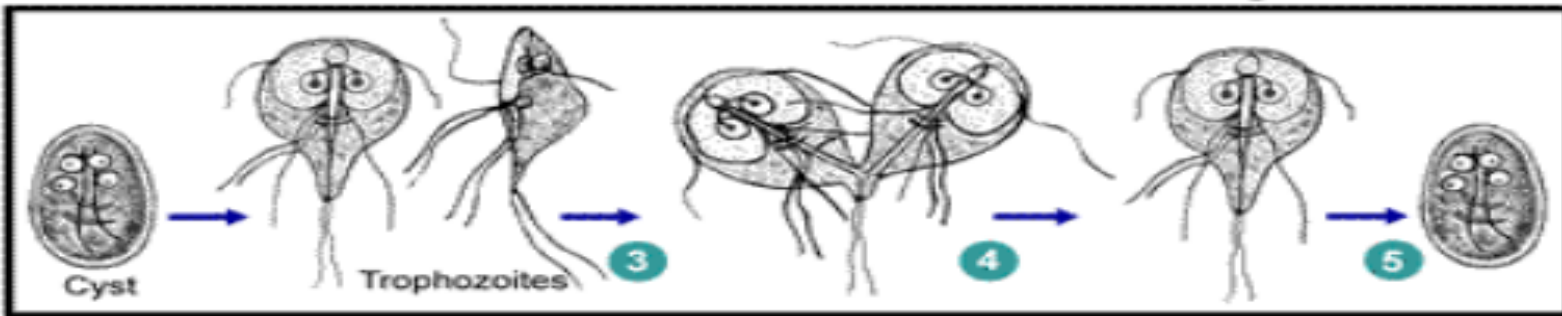
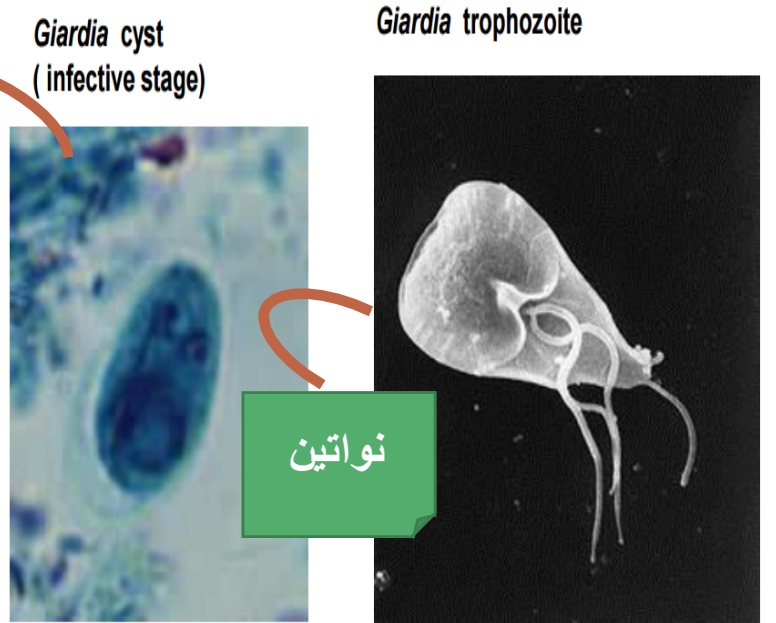
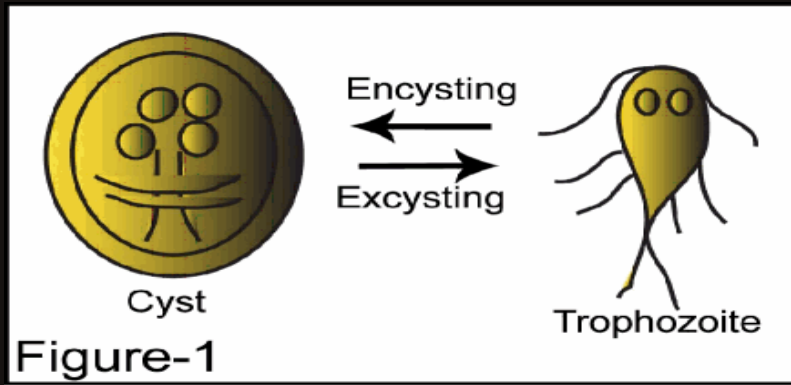
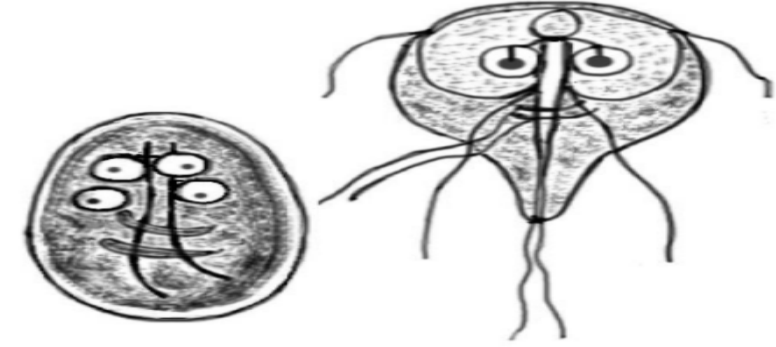
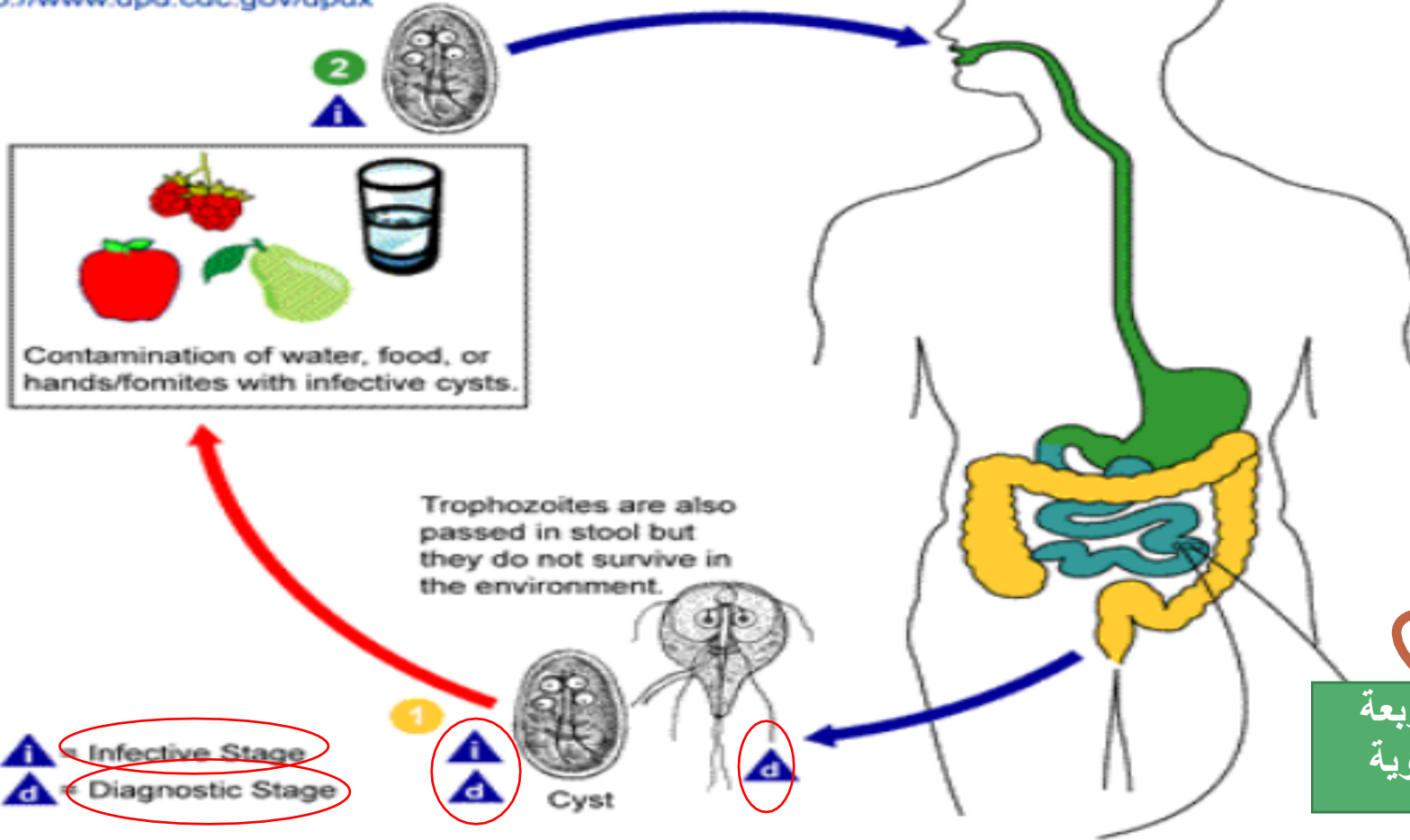
5- Both cysts and trophozoites are then passed in the feces (**but only the cyst is infectious**)



# THE LIFE CYCLE OF GIADIA LAMBLIA

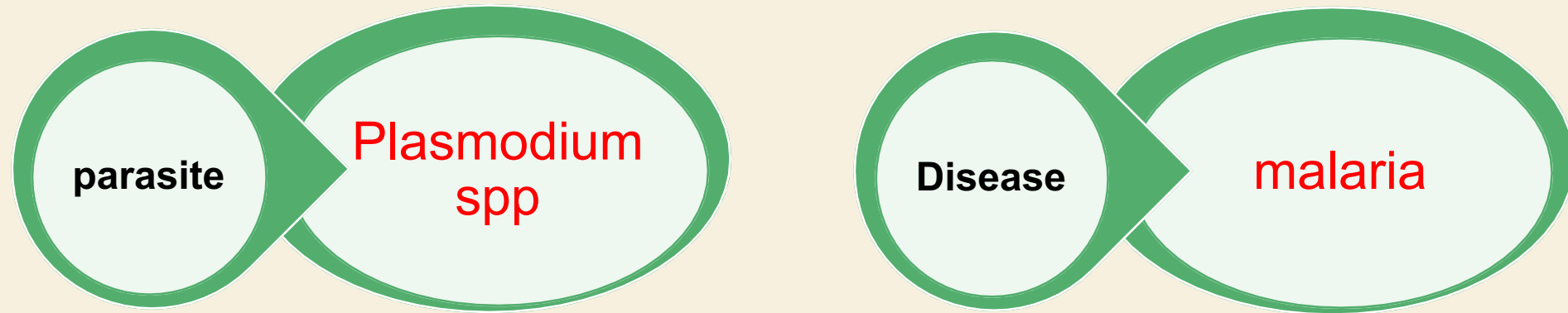
important

<http://www.dpd.cdc.gov/dpdx>





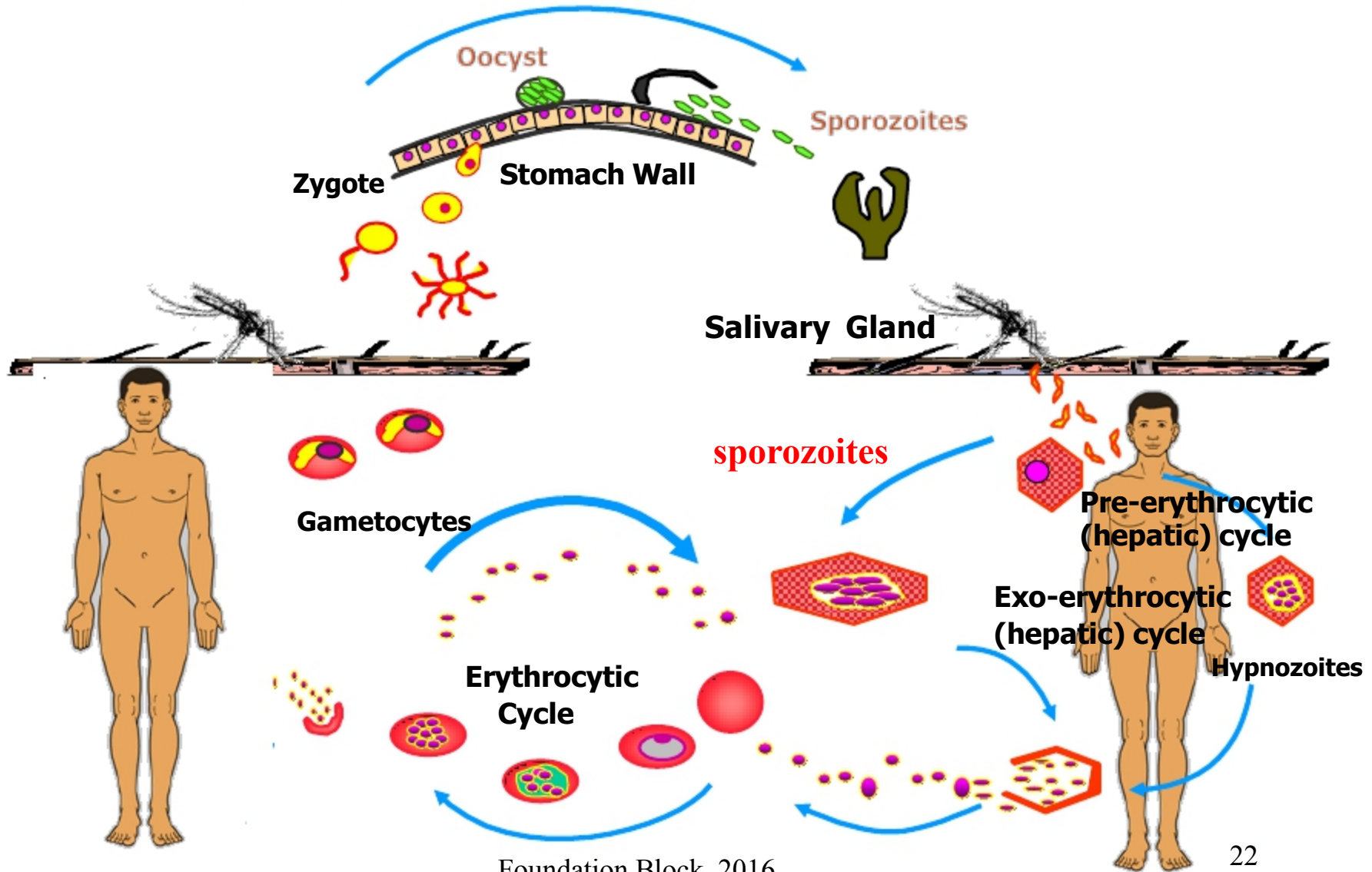
# Examples of Diseases caused by Blood and Tissue Protozoa



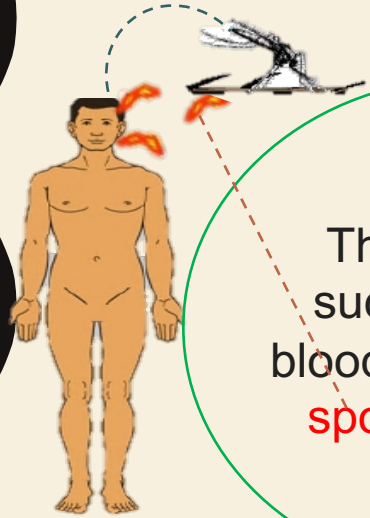
## Four main species of malaria :

*Plasmodium falciparum*  
*Plasmodium vivax*  
*Plasmodium ovale*  
*Plasmodium malariae*

# LIFE CYCLE OF MALARIA



A mosquito (anopheles)  
carrying plasmodium



Healthy human

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

2  
The sporozoites 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**

merozoites

Become **gametocytes** :  
male and female

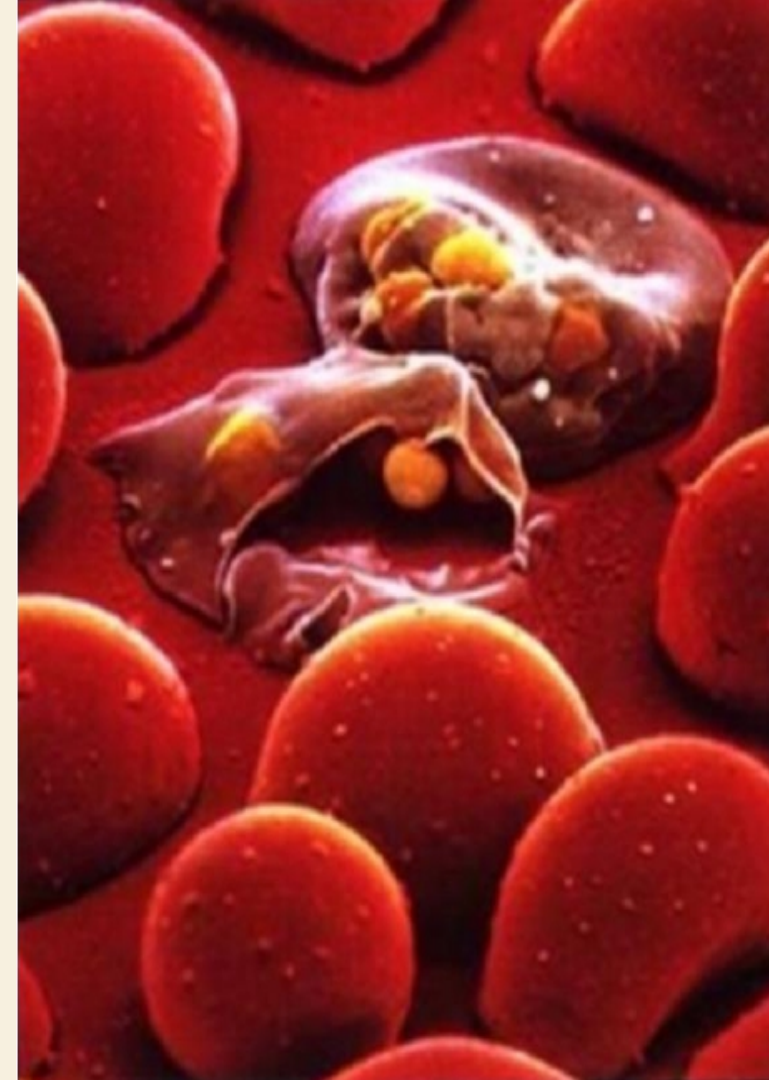
This will lead to severe anemia

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

# LIFE CYCLE OF MALARIA

## Important notes:

- sporozoits = **infective** stage
- Main pathogenic is in the **RBC**
- The replication in the **liver**
- 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**

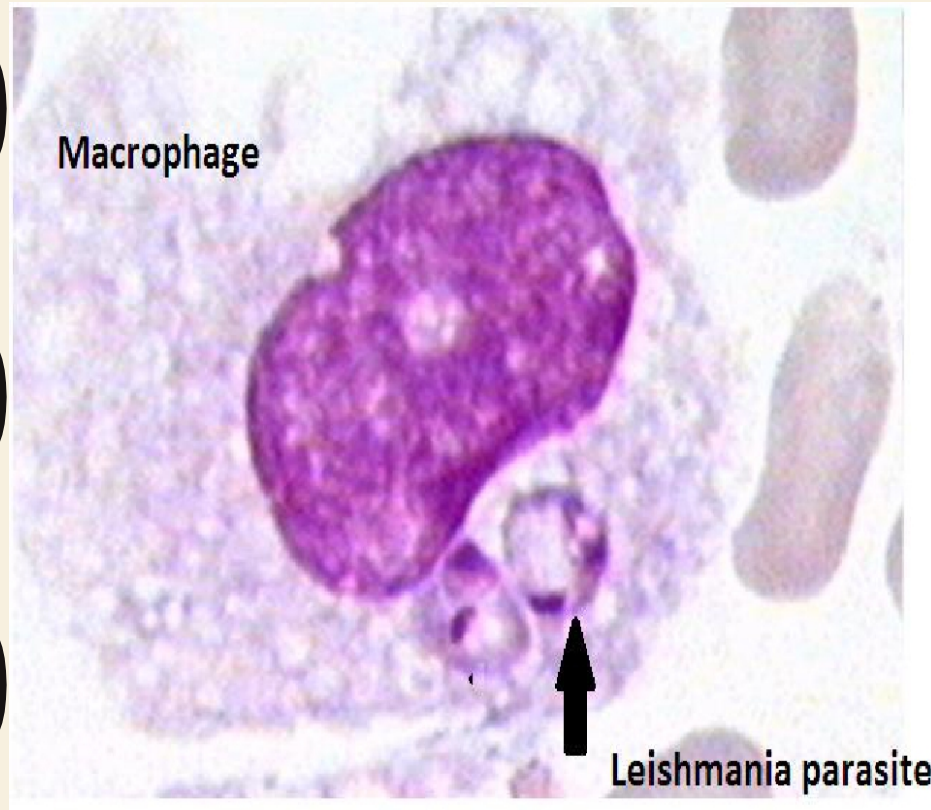
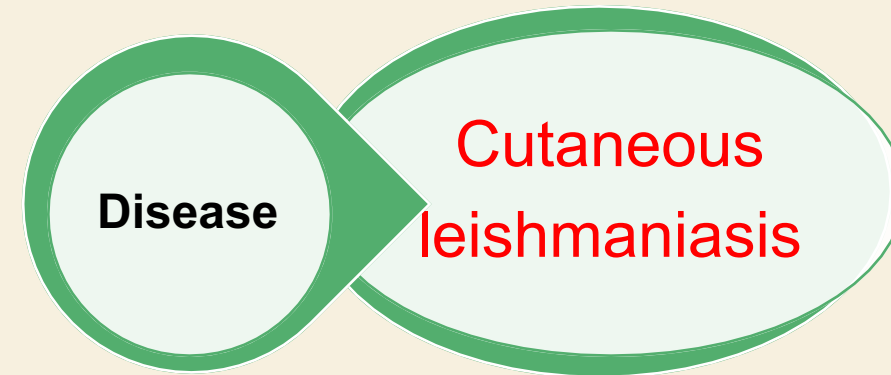
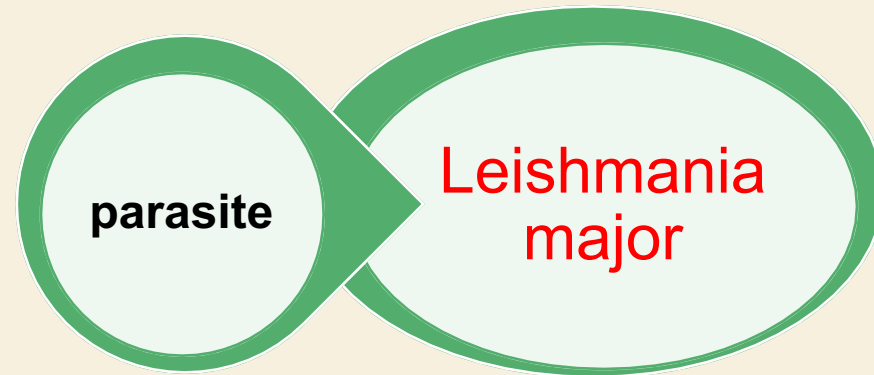


Malaria parasites  
inside red blood cells

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



# Examples of Diseases caused by Blood and Tissue Protozoa



# Sandfly Stages

# Human Stages

1 Sandfly takes a blood meal (injects promastigote stage into the skin)

2 Promastigotes are phagocytized by macrophages

3 Promastigotes transform into amastigotes inside macrophages

4 Amastigotes multiply in cells (including macrophages) of various tissues

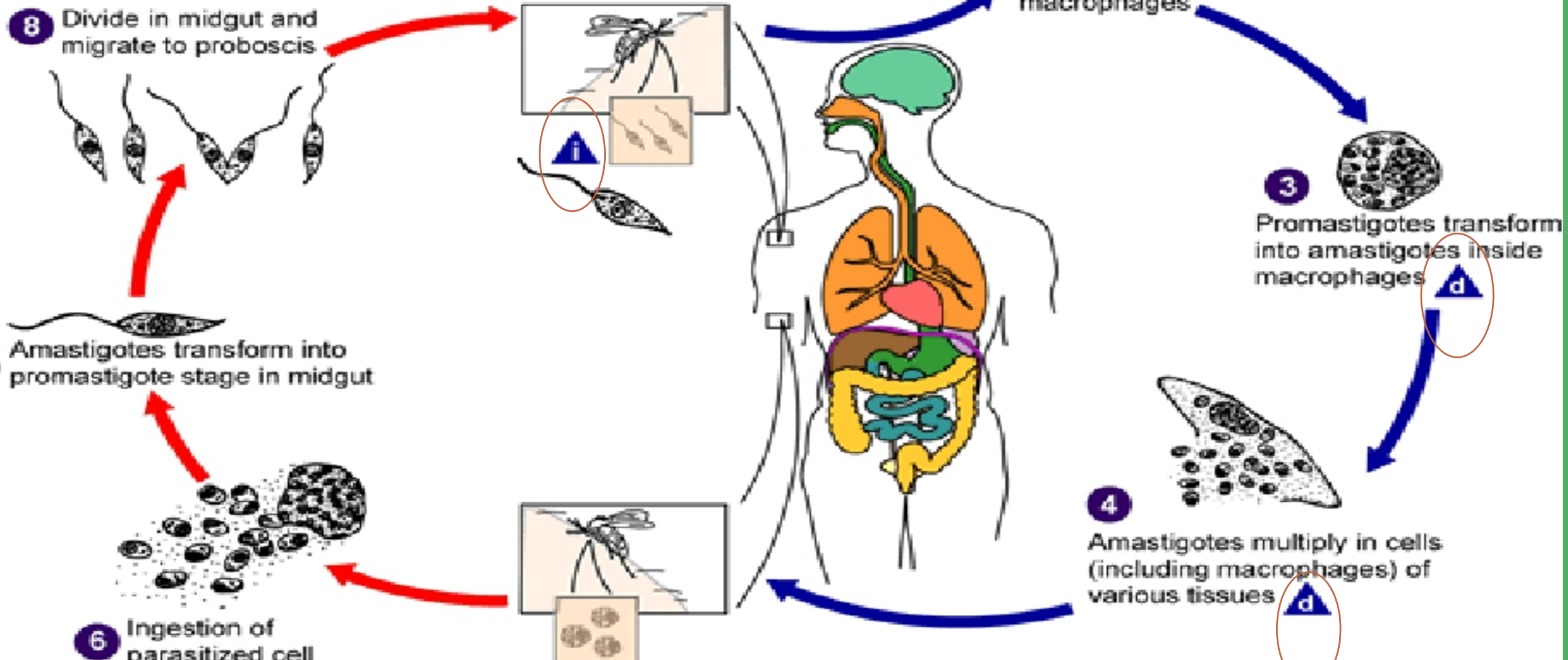
5 Sandfly takes a blood meal (ingests macrophages infected with amastigotes)

6 Ingestion of parasitized cell

7 Amastigotes transform into promastigote stage in midgut

8 Divide in midgut and migrate to proboscis

**i** = Infective Stage  
**d** = Diagnostic Stage





## Extra information

- The natural ecology of malaria involves malaria parasites infecting successively two types of hosts: humans and female Anopheles mosquitoes. In humans, the parasites grow and multiply first in the liver cells and then in the red cells of the blood. In the blood, successive broods of parasites grow inside the red cells and destroy them, releasing daughter parasites ("merozoites") that continue the cycle by invading other red cells.
- The blood stage parasites are those that cause the symptoms of malaria. When certain forms of blood stage parasites ("gametocytes") are picked up by a female Anopheles mosquito during a blood meal, they start another, different cycle of growth and multiplication in the mosquito.
- After 10-18 days, the parasites are found (as "sporozoites") in the mosquito's salivary glands. When the Anopheles mosquito takes a blood meal on another human, the sporozoites are injected with the mosquito's saliva and start another human infection when they parasitize the liver cells.
- Thus the mosquito carries the disease from one human to another (acting as a "vector"). Differently from the human host, the mosquito vector does not suffer from the presence of the parasites

In the life cycle of Plasmodium, a female Anopheles mosquito (the definitive host) transmits a motile infective form (called the sporozoite) to a vertebrate host such as a human (the secondary host), thus acting as a transmission vector. A sporozoite travels through the blood vessels to liver cells (hepatocytes), where it reproduces asexually (tissue schizogony), producing thousands of merozoites. These infect new red blood cells and initiate a series of asexual multiplication cycles (blood schizogony) that produce 8 to 24 new infective merozoites, at which point the cells burst and the infective cycle begins anew.

Other merozoites develop into immature gametocytes, which are the precursors of male and female gametes. When a fertilised mosquito bites an infected person, gametocytes are taken up with the blood and mature in the mosquito gut. The male and female gametocytes fuse and form a fertilized, motile zygote which develop into new sporozoites that migrate to the insect's salivary glands, ready to infect a new vertebrate host. The sporozoites are injected into the skin, in the saliva, when the mosquito takes a subsequent blood meal.

Only female mosquitoes feed on blood; male mosquitoes do not transmit the disease. The females of the Anopheles mosquito prefer to feed at night.



These videos are very useful check it out

## Malaria

<https://youtu.be/dyprqPM1rHI>

## Giardia lamblia

<https://youtu.be/-EGTyu8nD34>

<https://youtu.be/O7A9AuUT3dE>

Online quiz

<https://www.onlineexambuilder.com/microbiology-l4/exam-102584>

## THE TEAM :

- Waleed Aljamal
- Ibrahim Fetyani
- Meshal Eiaidi
- Khalid Alhusainan
- Hussam Alkhathlan
- Faisal Alqumaizi

Contact us :

[436microbiologyteam@gmail.com](mailto:436microbiologyteam@gmail.com)

Twitter :

@microbio436

## THE TEAM :

- Shrooq Alsomali
- Hanin Bashaikh
- Jawaher Alkhayyal
- Reem Alshathri
- Rawan Alqahtani
- Ohoud Abdullah
- Ghadah Almazrou
- Lama Al-musallm