

Introduction to Parasitic Diseases

Objectives:

By the end of this lecture the student should be able to:

1. Define common terms describing host-parasite relationship.
2. Outline the broad classification of parasites.
3. Describe the life-cycle of *Giardia lamblia* as an example of intestinal protozoa.
4. Describe the life-cycle of *Plasmodium* as an example of blood and tissue protozoa.

Key words: Parasites Protozoa , helminths *Giardia* , *Plasmodium*

Summary :

1. **Infection** :The entry and development and multiplication of an infectious agent in the body of humans or animals. The result may be :
 - a. inapparent (asymptomatic) infection, or
 - b. manifest (symptomatic) infection..
2. **Host** :A person or other living animal which harbours an infectious agent under natural conditions.
3. **Definitive host** :primary host) a host in which the parasite passes its sexual stage.
4. **Intermediate host:** secondary host) a host in which the parasite passes its larval or asexual stages.
5. **carrier** :A person or animal that harbours a specific infectious agent in the absence of discernible clinical disease and serves as a potential source of infection
6. **pathogenesis** :Production and development of disease.
7. **pathogenicity** :Capability of an infectious agent to cause disease in a susceptible host.

8. **Parasitism** : a relationship in which an organism (the parasite) benefits from the association with another organism (the host) whereas the host is harmed in some way.
9. **commensalism** :Kind of relationship in which one organism the commensal, is benefited whereas the other organism ,the host , is neither harmed or helped by the association.
10. **ectoparasite**: parasite that lives on the outer surface of its host.
11. **endoparasite**: Parasite that lives inside its host.
12. **zoonosis**: Disease of animals that is transmissible to humans.

Scientific names of parasites follow Zoological Classification ending in Genus and Species

Classification of Parasites

PROTOZOA	HELMINTHS
Unicellular Single cell for all functions	Multicellular Specialized cells
1:Amoebae: move by pseudopodia. 2:Flagellates: move by flagella. 3:Ciliates: move by cilia 4:Apicomplexa(Sporozoa) tissue parasites	<u>Round worms (Nematodes):</u> - elongated, cylindrical, unsegmented. <u>Flat worms :</u> - Trematodes: leaf-like, unsegmented. - Cestodes: tape-like, segmented.

Parasitic Protozoa :

Intestinal protozoa e.g.

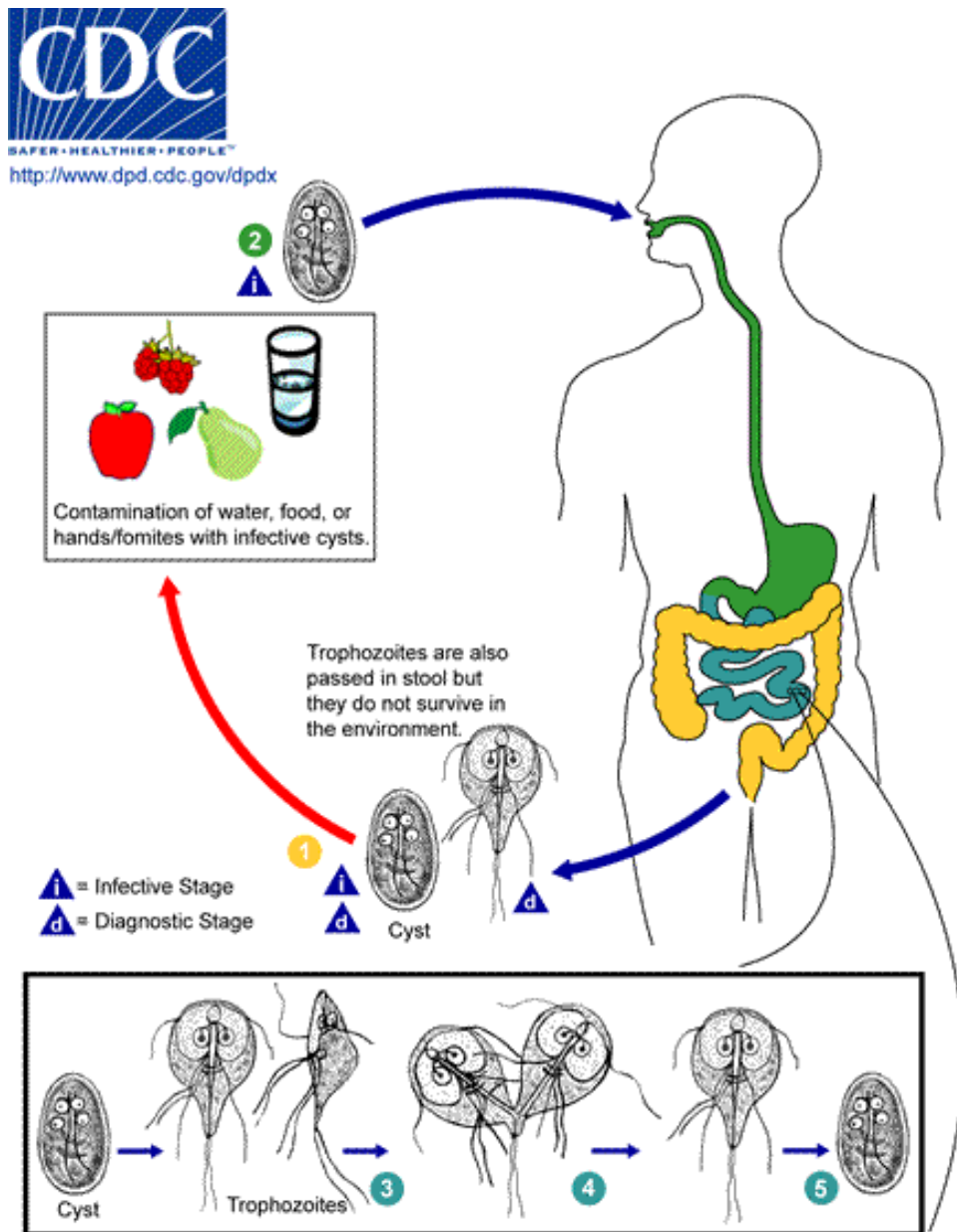
Giardia lamblia, causing giardiasis

Entamoeba histolytica causing amoebiasis

Blood and tissue protozoa

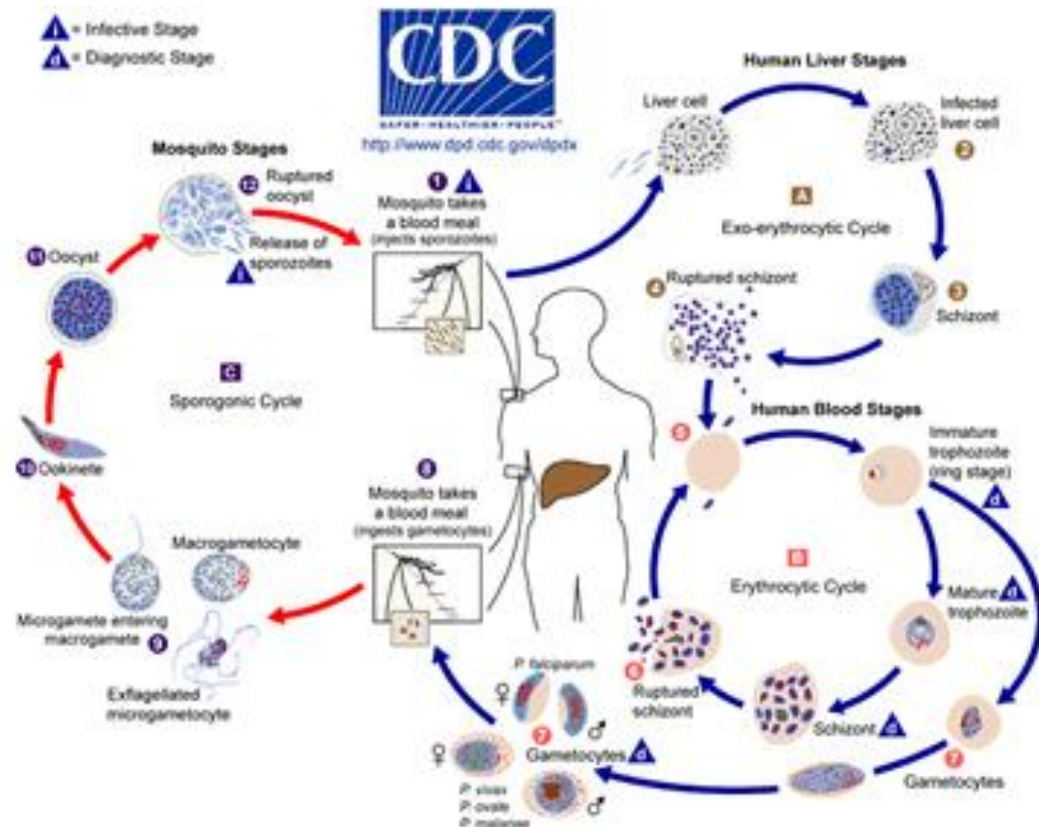
Malaria parasites Plasmodium falciparum, P. vivax ,P. ovale and P. malariae.

Leishmania causing leishmaniasis



Life cycle of Giardia lamblia

Life cycle of malaria parasites



Source: Malaria Foundation International

In order to survive the malaria parasite needs two hosts: the mosquito as primary and the human as alternate host. During a blood meal, a malaria-infected female *Anopheles* mosquito inoculates sporozoites into the human host ①. Sporozoites infect liver cells ② and mature into schizonts ③, which rupture and release merozoites ④. After this initial replication in the liver (exo-erythrocytic schizogony A), the parasites undergo asexual multiplication in the erythrocytes (erythrocytic schizogony B). Merozoites infect red blood cells ⑤. The ring stage trophozoites mature into schizonts, which rupture releasing merozoites ⑥. Some parasites differentiate into sexual erythrocytic stages (gametocytes) ⑦. Blood stage parasites are responsible for the clinical manifestations of the disease.

The gametocytes, male (microgametocytes) and female (macrogametocytes), are ingested by an *Anopheles* mosquito during a blood meal ⑧. The parasites' multiplication in the mosquito is known as the sporogonic cycle C. While in the mosquito's stomach, the microgametes penetrate the macrogametes generating zygotes ⑨. The zygotes in turn become motile and elongated (ookinetes) ⑩ which invade the midgut wall of the mosquito where they develop into oocysts ⑪. The oocysts grow, rupture, and release sporozoites ⑫, which make their way to the mosquito's salivary glands. Inoculation of the sporozoites ⑬ into a new human host perpetuates the malaria life cycle.⁶