Foundation Block

Introduction to Parasitology

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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. **Name examples of protozoan parasites.**
4. **Describe the life-cycle of *Giadia 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.**

DEFINITIONS

- ***Infection:***

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

  - **in apparent (asymptomatic) infection**
  - **manifest (symptomatic) *infection***

DEFINITIONS

- ***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

- ***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*

- ***pathogenesis:***

  Production and development of disease.

- ***pathogenicity:***

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

DEFINITIONS

- ***Parasitism:***

  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.

- ***commensalism:***

  Kind of relationship in which one organism, the commensal, is *benefited* whereas the other organism, the host, *is not* harmed or even helped by the association.

DEFINITIONS

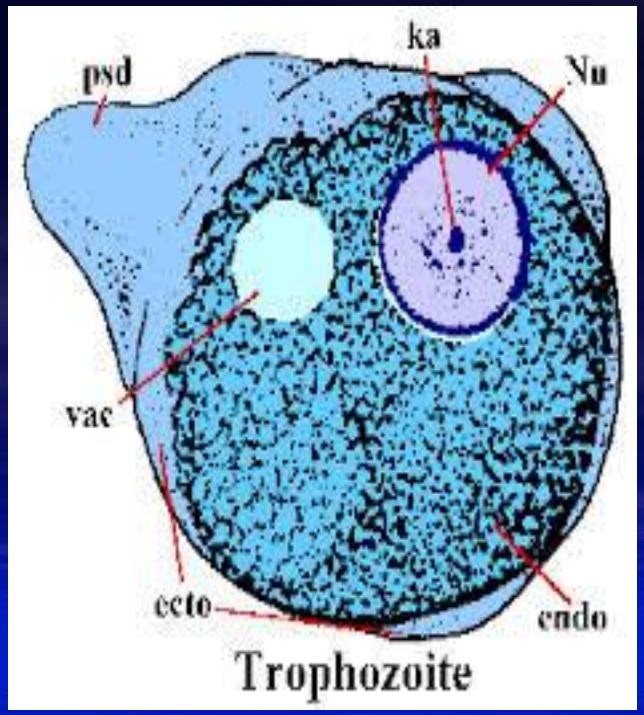
- ***Ectoparasite:*** parasite that lives on the outer surface of its host
- ***Endoparasite:*** Parasite that lives inside its host
- ***zoonosis:*** Disease of animals that is transmissible to humans

Scientific names of parasites follow Zoological Classification

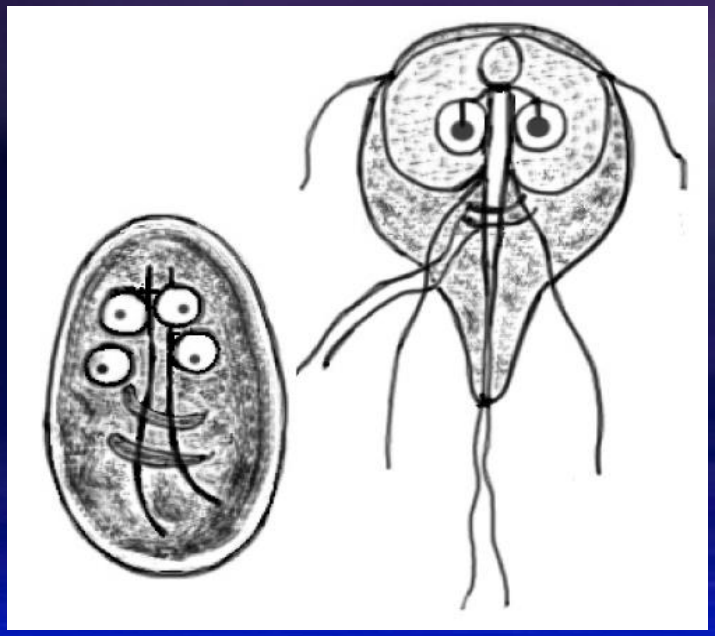
- Kingdom
- Division
- Class
- Order
- Family
- Genus
- Species

CLASSIFICATION OF PARASITES

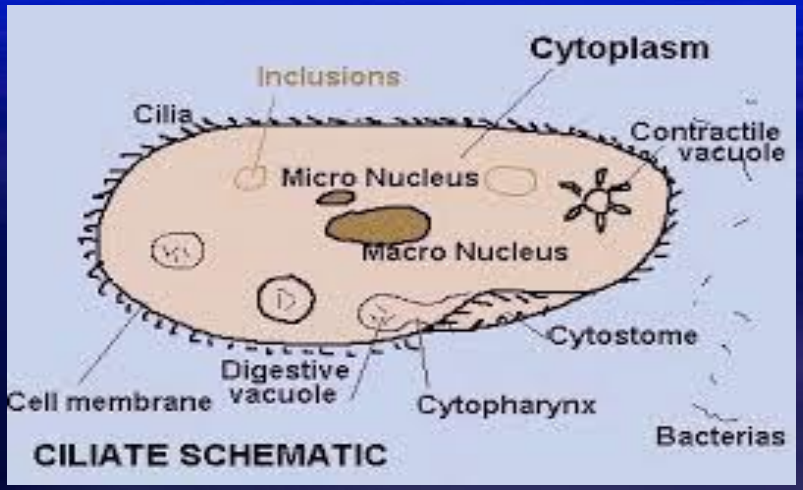
PROTOZOA	HELMINTHS
Unicellular Single cell for all functions	Multicellular Specialized cells
1: Amoebae: move by pseudopodia. 2: Flagellates: move by flagella. 3: Ciliates: move by cilia 4: Apicomplexa (Sporozoa) tissue parasites	Round worms (Nematodes) - elongated, cylindrical, unsegmented. Flat worms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



Pseudopodia

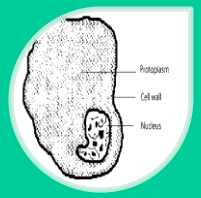


Flagella

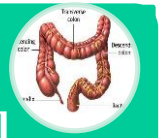


Cilia

Parasitic Protozoa



Intestinal

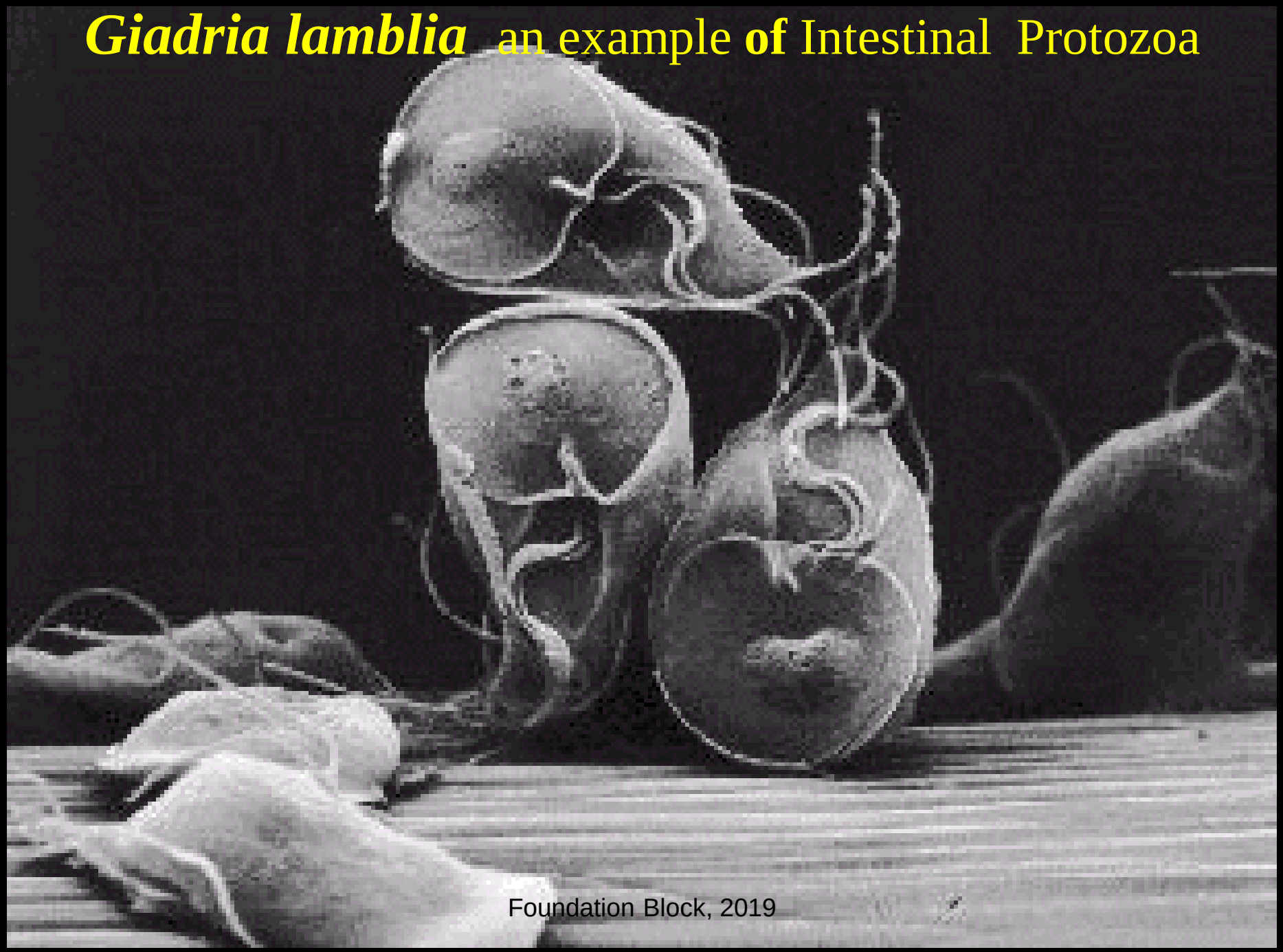


Blood and tissues

Examples of Diseases caused by Intestinal Protozoa

Parasite	Disease
Giardia lamblia	giardiasis
Entamoeba histolytica	amoebiasis

Giadria lamblia an example **of** Intestinal Protozoa



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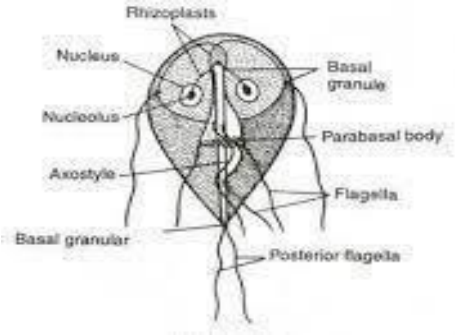
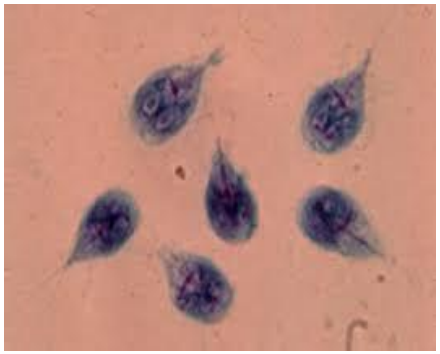
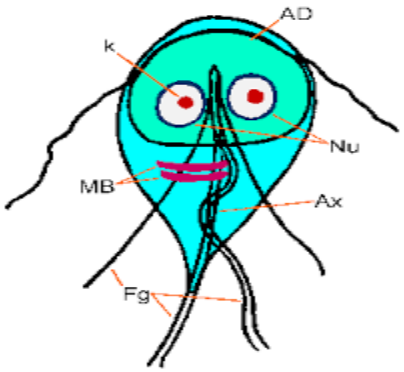
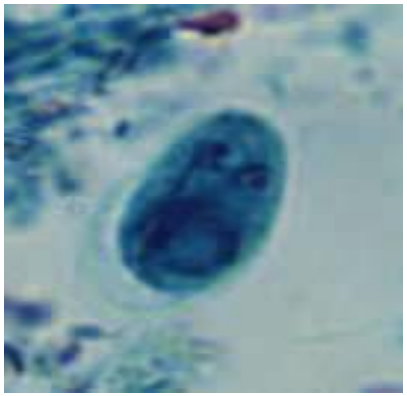


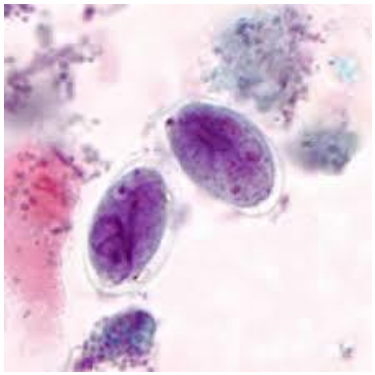
Giardia trophozoite

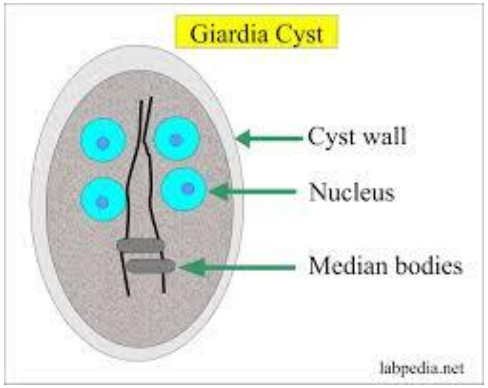




Giardia cyst (infective stage)







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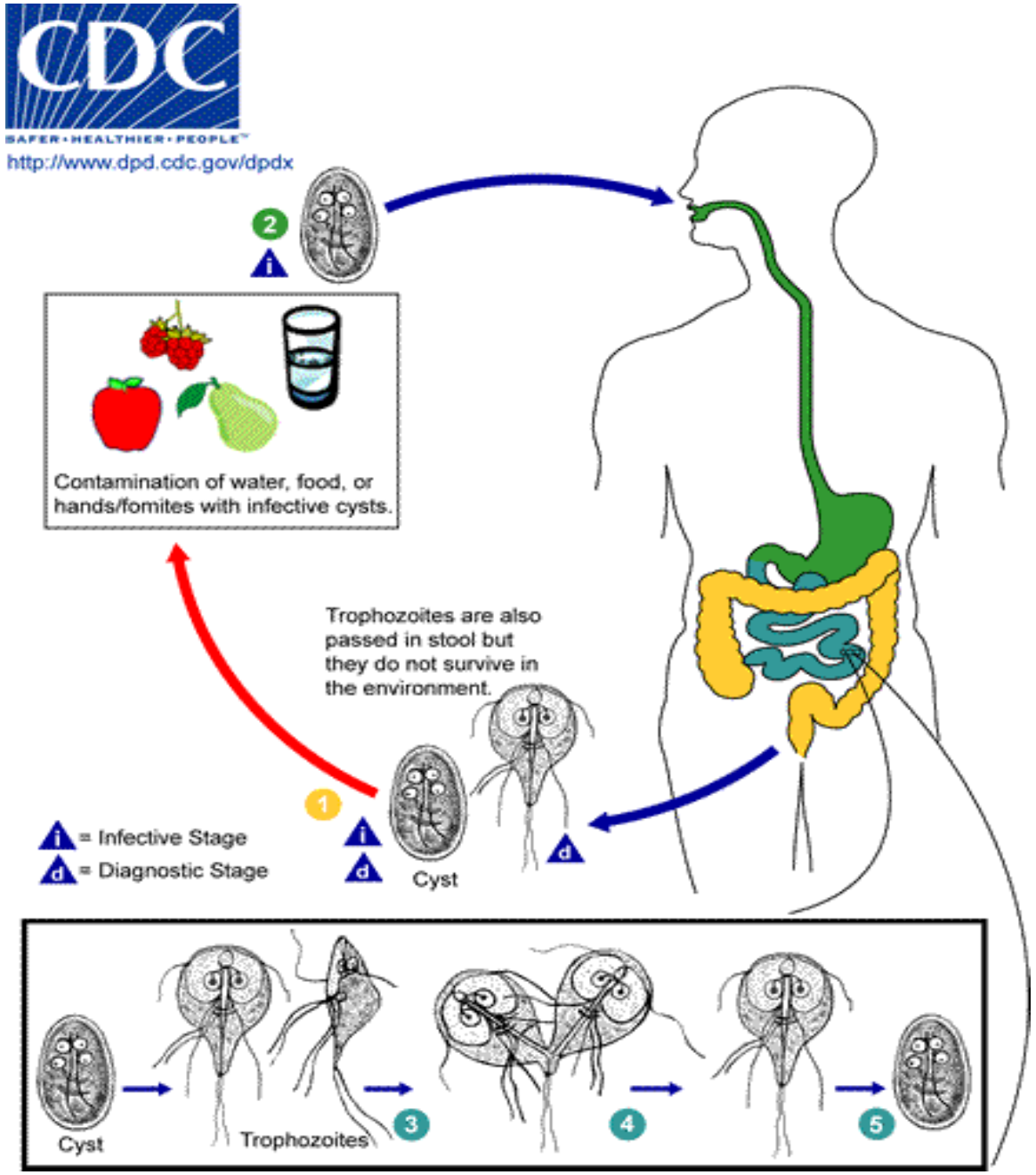


Giardia lamblia

Can cause diarrhea with poor absorption of the nutrient, loss of appetite, stomach cramp, vomiting.

Giardia infect the cells of the duodenum and jejunum

1. ***Giardia*** **cysts** are the infective stage of ***G. lamblia***. These **cysts** are ingested by consuming contaminated food or water, or fecal-orally. They can survive outside the body for several months, and are also relatively resistant to chlorination, UV exposure and freezing.

2. When **cysts** are ingested, the low pH of the stomach, the acidity produces excystation. (Excystation means the releases of **trophozoites)**.

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

4. Some **trophozoites** then encyst in the small intestine, Both **cysts** and **trophozoites** are then passed in the feces, but only the **cyst** is infectious, Person-to-person transmission is possible, Animals can also be infected with ***Giardia***

Examples of Diseases caused by Blood and Tissue Protozoa

Parasite	Disease
Plasmodium spp.	**malaria**

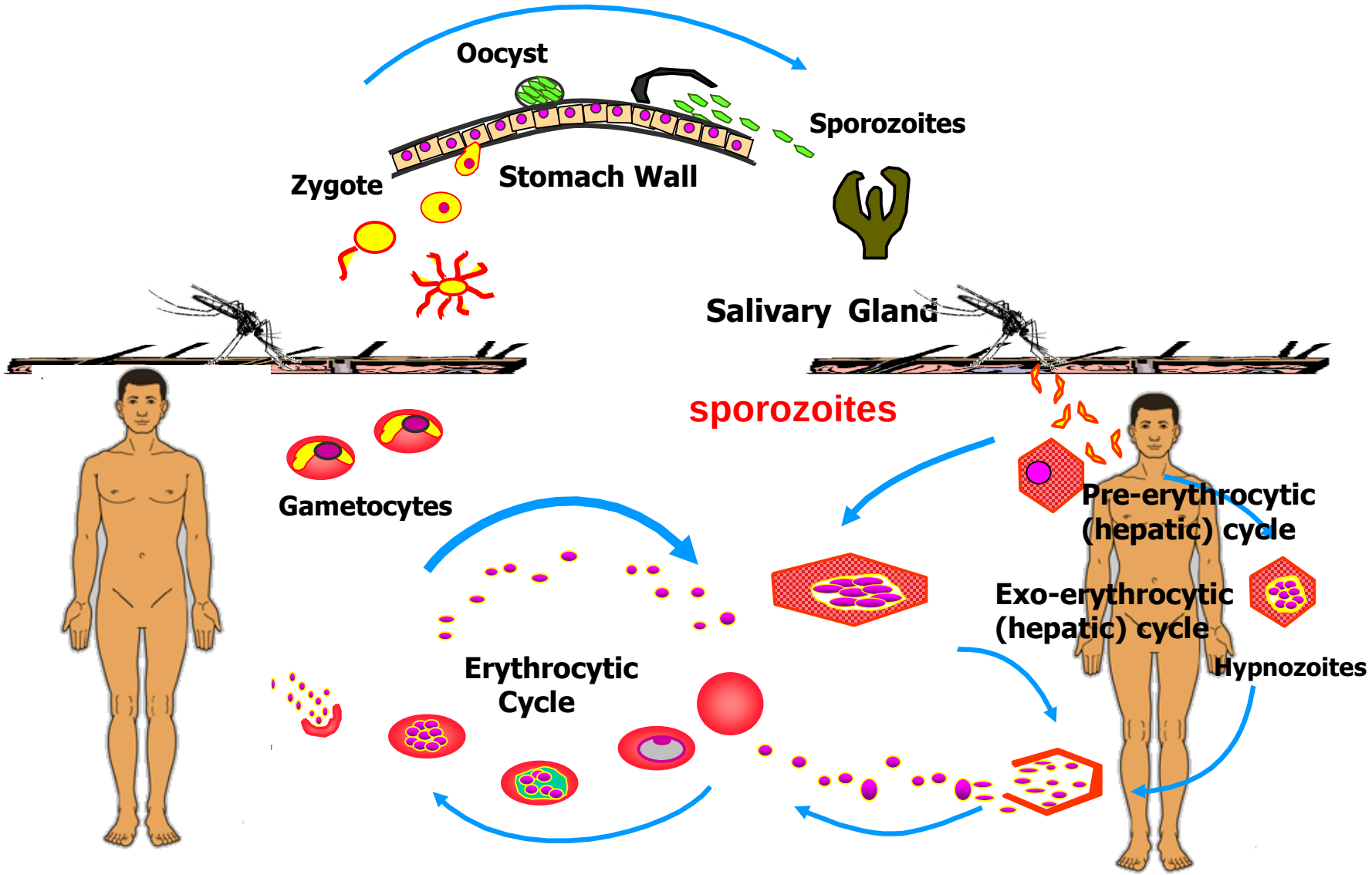
Mosquito

Malaria **Species**

Four main species of human **malaria**:

1. ***Plasmodium falciparum***
2. ***P. vivax***
3. ***P. ovale***
4. ***P. malariae***

LIFE CYCLE OF MALARIA



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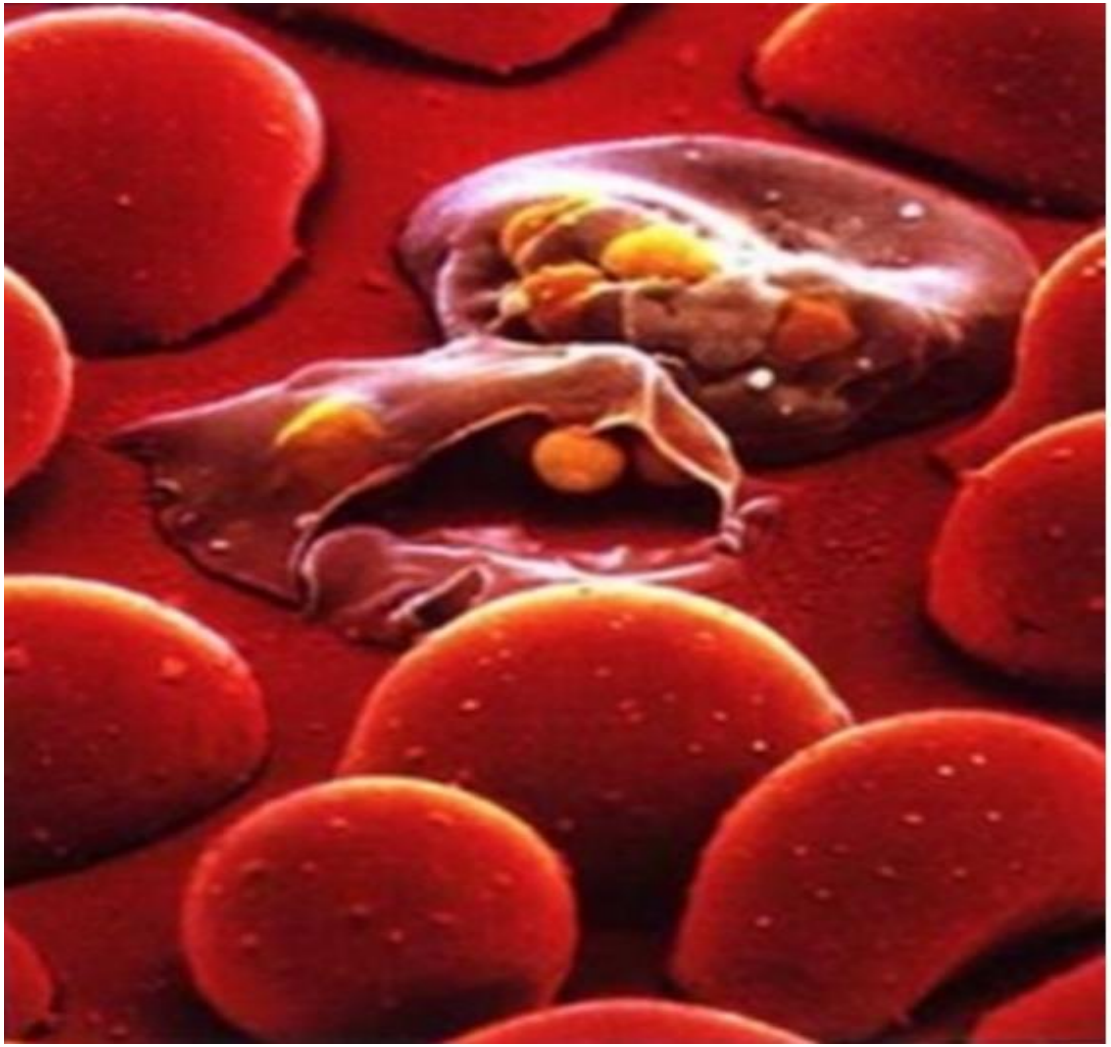


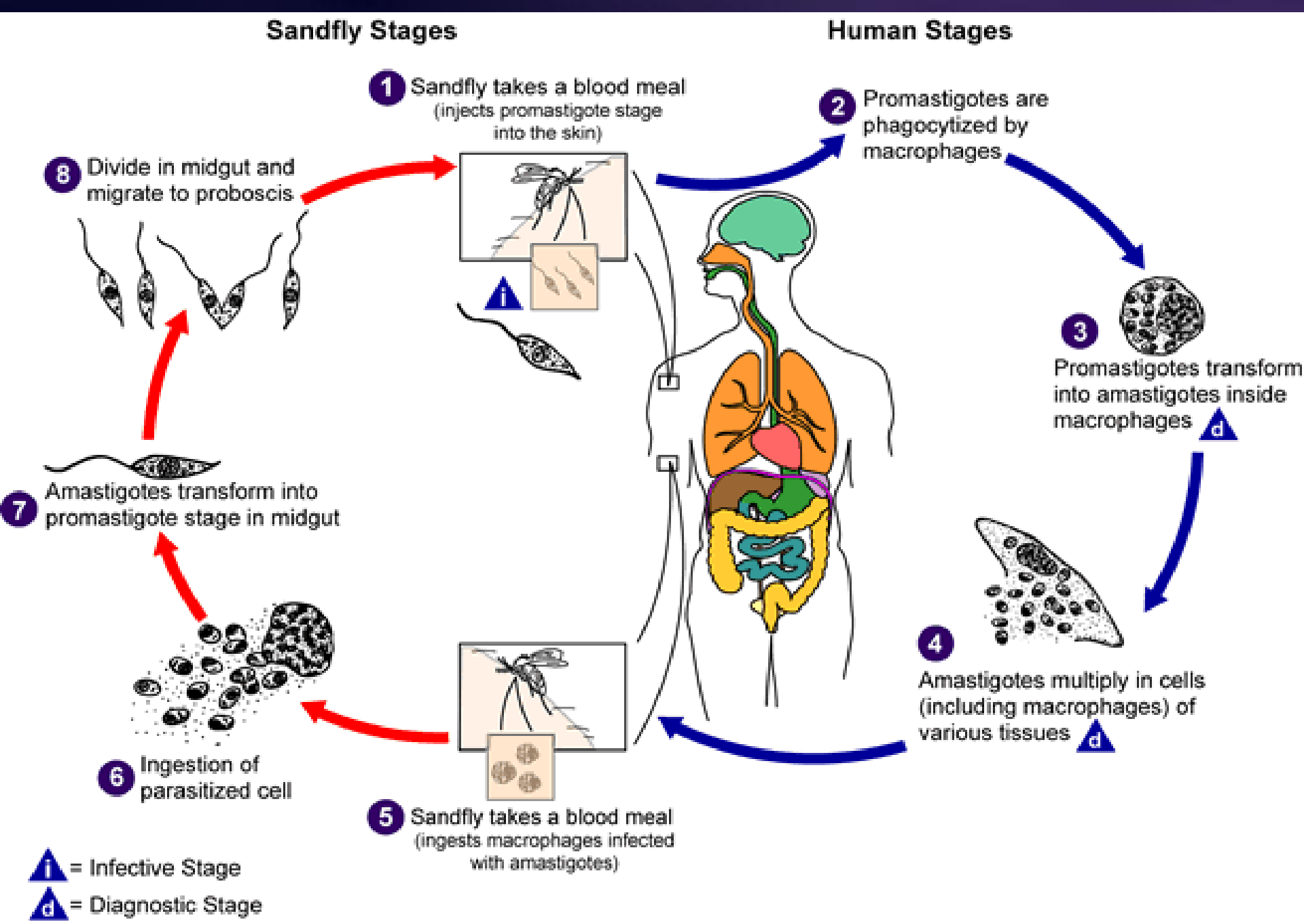
Malaria parasites
inside red blood cells

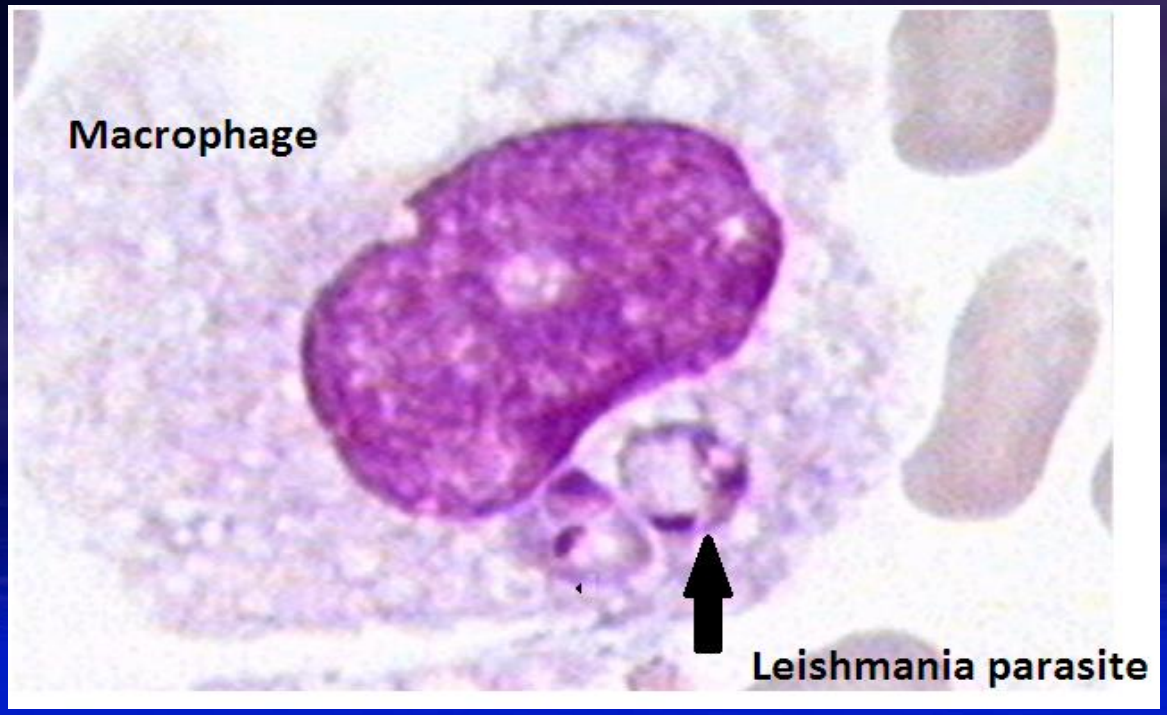
Main pathology of malaria is due to invasion of the RBCs

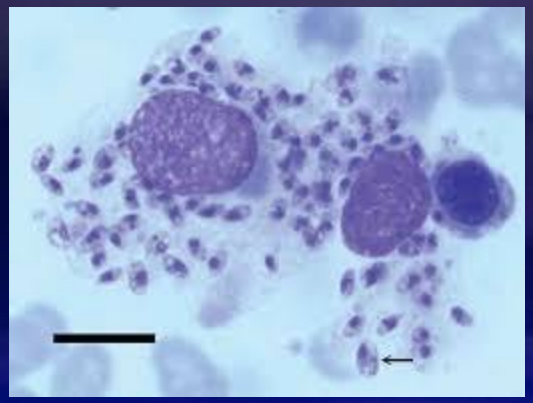
Examples of Diseases caused by Blood and Tissue Protozoa

Parasite	Disease
Leishmania major	Cutaneous leishmaniasis

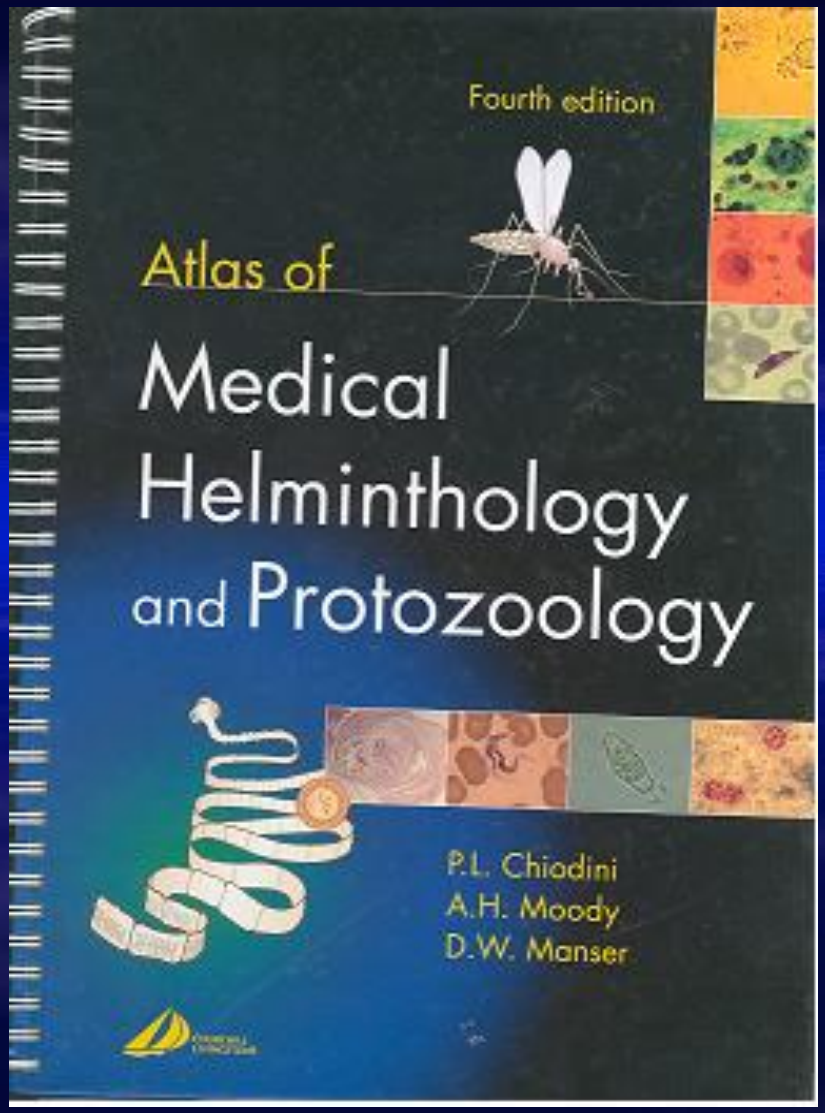
Cutaneous leishmaniasis caused by *Leishmania major*

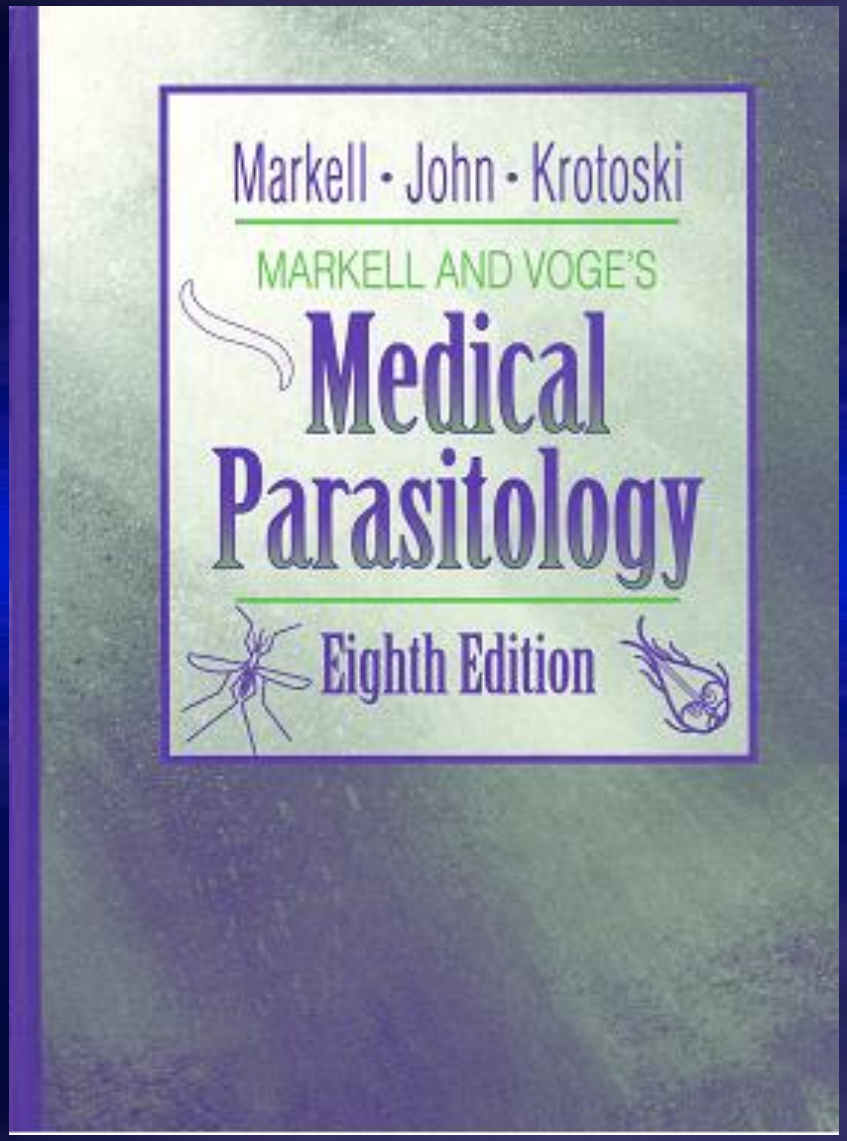

Sandfly Stages
Human Stages
1 Sandfly takes a blood meal
(injects promastigote stage
into the skin)
2 Promastigotes are
phagocytized by
macrophages
3 Promastigotes transform
into amastigotes inside
macrophages
d
4 Amastigotes multiply in cells
(including macrophages) of
various tissues
d
5 Sandfly takes 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


Macrophage
Leishmania parasite



Resources on Parasitology





Resources on Parasitology

Centre for Disease Control and Prevention (CDC) :

http://www.dpd.cdc.gov/DPDx/HTML/Para_Health.htm