



General Microbiology Course

Lecture 23

(Plasmodium, Fungi, Mycology , Schistosomiasis)

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Malaria

- **Malaria parasites are intracellular protozoa.**
- Malaria is Potentially life-threatening disease caused by protozoa, transmitted to humans from infected female arthropods.
- Malaria parasites are intracellular protozoa.
- They infect the red blood cells (RBCs)
- Malaria is mainly a disease of tropical and subtropical areas.
- Malaria is preventable and curable.
- If left untreated, the development of severe complications can cause death.
- Malaria is usually restricted to **tropical and subtropical areas** but this distribution might be affected by climatic changes, especially global warming and population movements.

Malaria

- Malaria parasites infecting humans belong to four species:
 - *Plasmodium falciparum* (50% of malaria cases).
 - *P. vivax* (about 40%).
 - *P. malariae* (about 7%).
 - *P. ovale* (less than 3%).
- They cause a life-threatening protozoan disease called malaria.
- It is the most important of all the tropical diseases in terms of morbidity and mortality.
- **More than 300-500 million** individuals throughout the world are infected with malaria, and **1.5-2.7 million people** a year, most of whom are children, are being **killed** by the disease.
- Malaria parasites are transmitted to human hosts by **female mosquitoes of the genus Anophele**

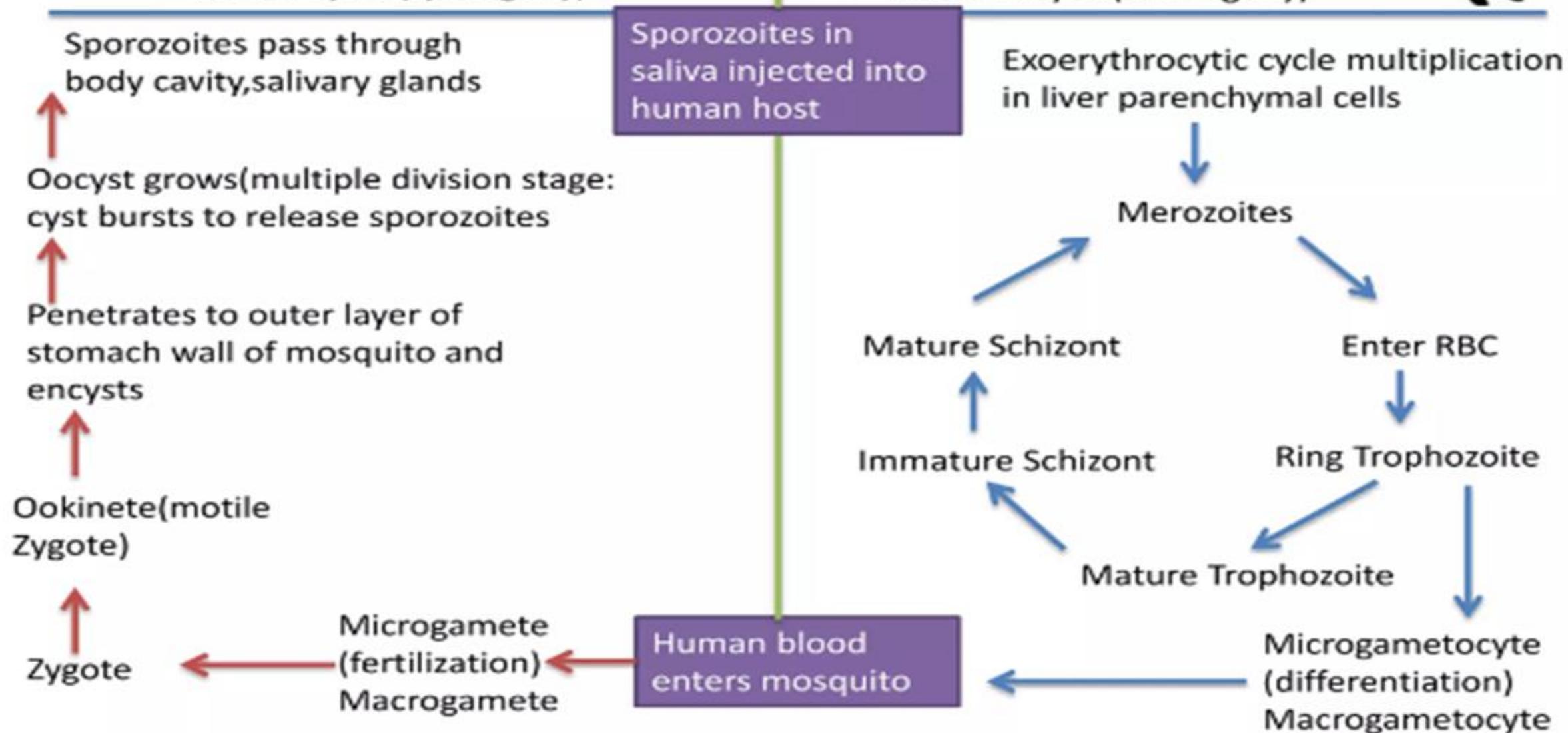


Life Cycle

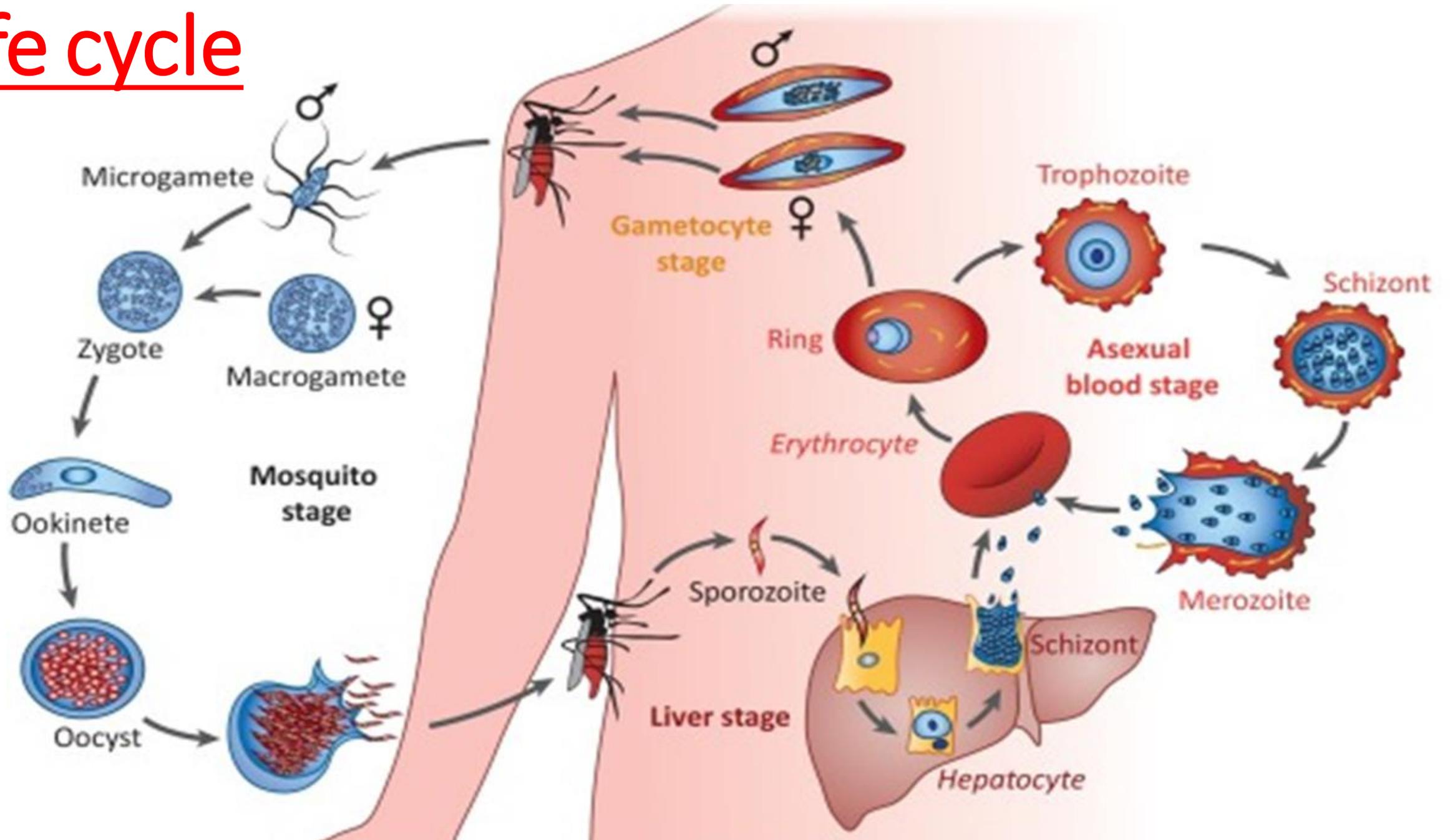


Exogenous Phase (in Mosquito)
Sexual Cycle (sporogony)

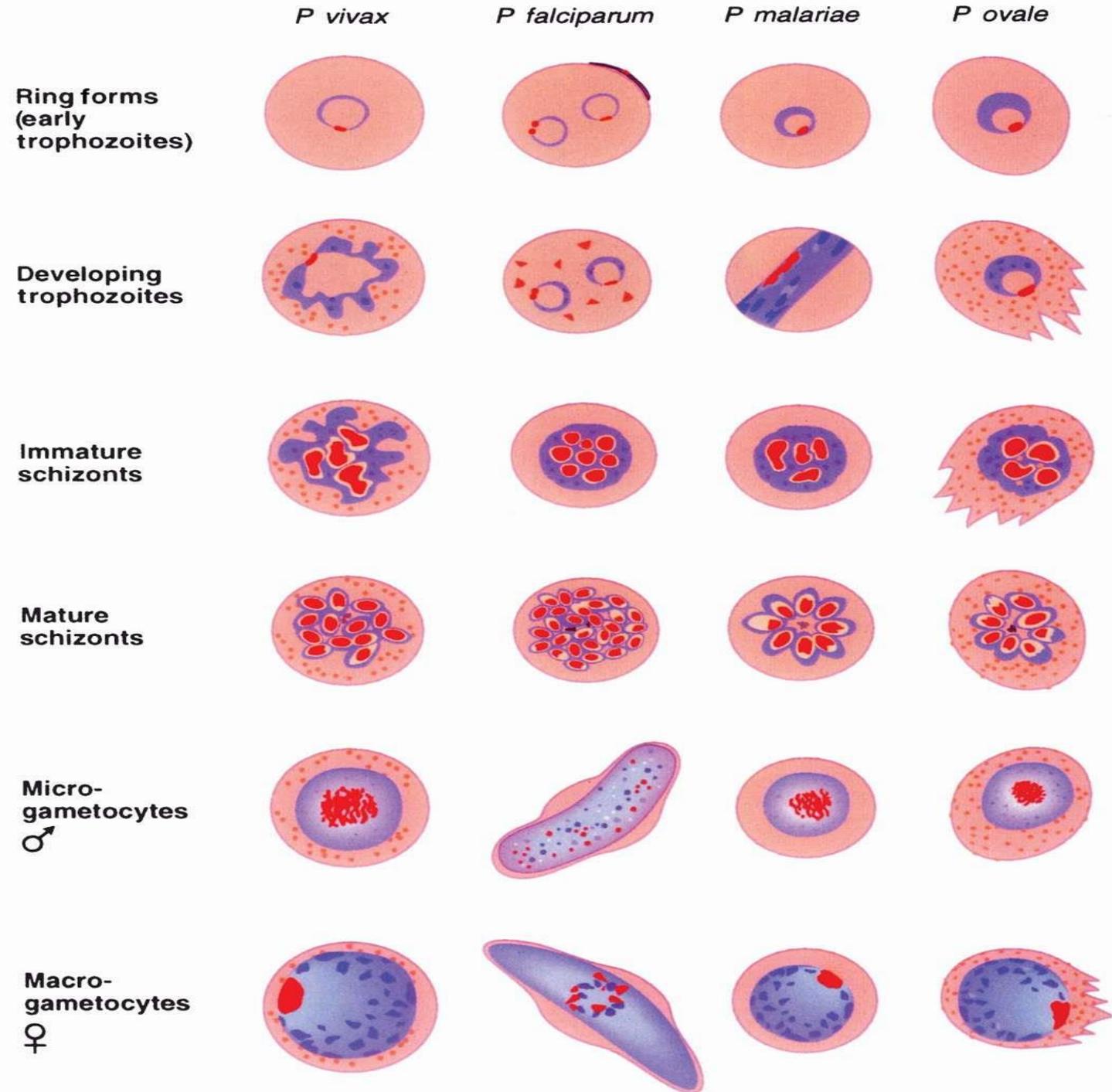
Endogenous Phase (in Human)
Asexual Cycle (Schizogony)



Life cycle



Stages of different Plasmodium species



Malaria

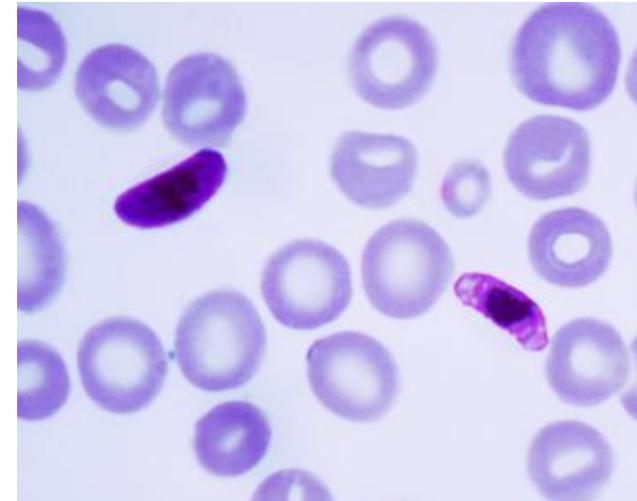
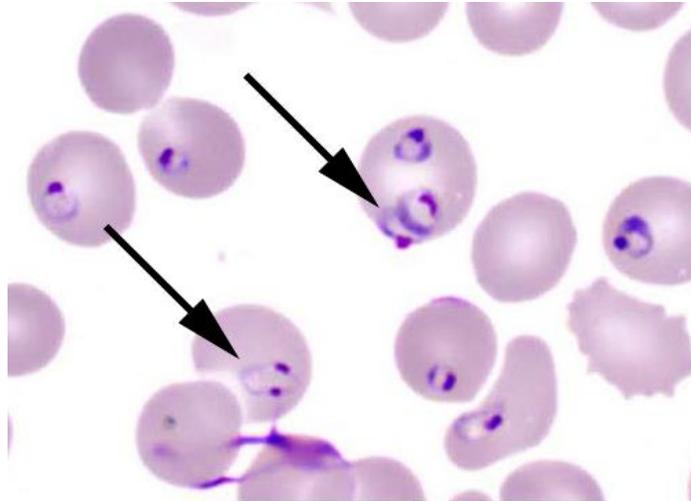
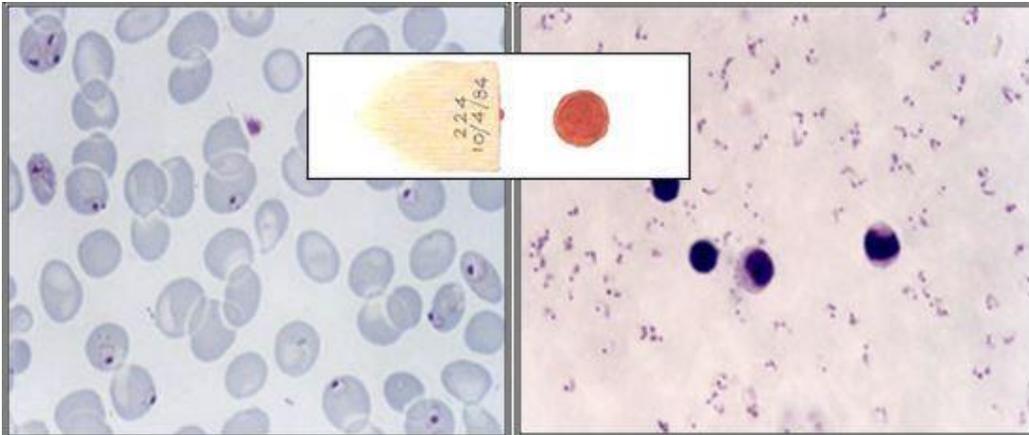
Pathogenesis:

- Man gets infection by **the bite of infected female anopheles mosquito**. However, infection may also be transmitted by:
 1. Transfusion of blood from a patient of malaria. This is known as **transfusion malaria**.
 2. Transfusion of infection to fetus *in utero* through some placental defect. This is known as **congenital malaria**.
 3. By the use of contaminated syringes particularly in drug addicts.

Malaria, Diagnosis

By making (blood films):

1. Thick blood films: are frequently used using Giemsa technique. This type allows rapid examination of a large volume of blood in a small area on the slide. These films provide a concentration of the parasites.
2. Thin blood films: It is stain by Giemsa stain or Wright stain



Malaria, Treatment

- All malaria infection except resistant *P. falciparum*: Chloroquine diphosphate (orally).
- Treatment of attack: If oral dose can't be given, Quinine dihydrochloride (IV), Chloroquine hydrochloride (IM).

Fungi

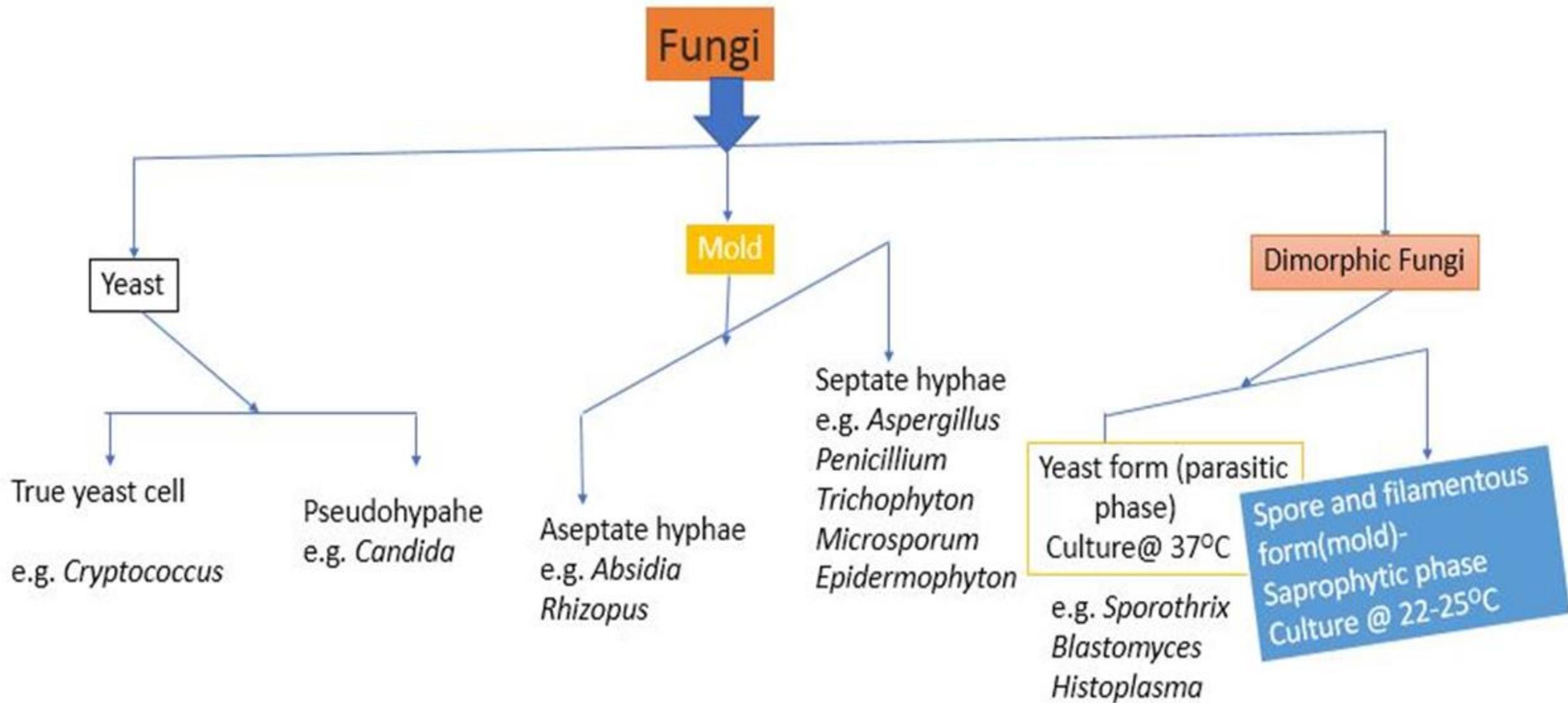
Fungi

- Mycology is the science that deals with the study of fungus.
- Medical mycology: study of fungi that causes the disease.

General Features Fungus

- The fungi are a group of eukaryotic organisms.
- They are found in soil, water, air, and decaying matter are the main sources.
- They have a diversity of morphological appearances, depending on the species.
- They are heterotrophic organisms that lack the definite root, stem, and leaves of higher plants.
- They are saprophytic or parasitic because of requiring prepared food.
- Having more complex structures and greater size, they differ from bacteria.
- They are mainly found in two forms: yeast and Mold as well as the more familiar mushrooms.
- Yeast is unicellular whereas mold is filamentous and multicellular.

Morphological classification of Fungi



Fungi

Yeast

- Unicellular form

Size

- Width: 1-5 μm
- Length: 5-30 μm

Shape

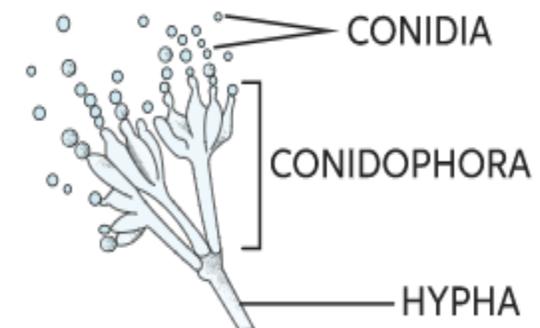
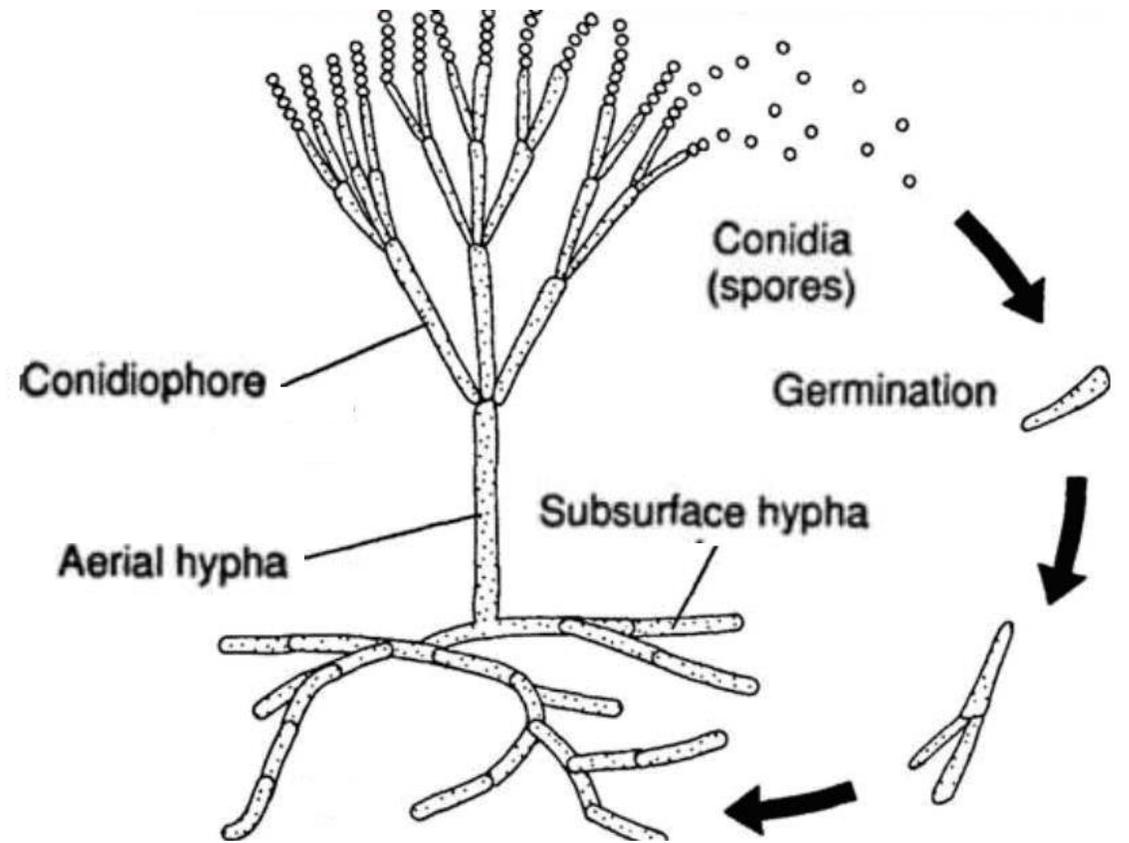
- Commonly oval shape but some may be elongated or spherical.
- Each species has a characteristic shape.
- Non-motile due to lacking flagella or organ of locomotion.



Fungi

Molds

- Molds are multicellular filamentous fungi consist of mycelium and spores.
- The mycelium is composed of branching filaments called hyphae
- The hyphae may be aseptate i.e. without walls or separate with a central pore in each cross wall.
- Mycelium has two forms-
 - a) Vegetative mycelium (subsurface hyphae)
 - b) Reproductive mycelium also called aerial mycelium.



General Mycology

General Mycology

➤ Mycology is the study of fungi.

➤ Mycosis is the diseases caused by fungi.

❖ **General characters of fungi:**

1- **Most of them** are saprophyets in soil(consume dead & decaying matter) and **few of them** are parasitic causing diseases in man & animals.

2- They are **eukaryotic cells** (has true nucleus, endoplasmic reticulum & mitochondria).

3- Have **cell wall** consisted primarily of **chitin**. So they resist penicillin and cephalosporins that inhibit the synthesis of cell wall peptidoglycan.

4- Their **cell membrane** contains **ergosterol** in contrast to human cell membrane which contains **cholesterol**.

5- Most of them are **obligate aerobes** & **need carbon for growth** so live on decaying organic matter.

Beneficial effects of fungi

- 1- **The fermentation** property is used for the industrial production of alcohol, fats, citric acids.
- 2- **Sources of antibiotics** such as Penicillin.
- 3- Some fungi are edible (**mushrooms**).
- 4- Yeasts provide nutritional supplements such as **vitamins**.
- 5- Some fungi produce **Ergot alkaloids** that help in inducing uterine contractions, controlling bleeding & treatment of migraine.
- 6- Some fungi are **used to trap mosquito larvae** so help in malaria control.

Harmful effects of fungi

- 1- Destruction of food, lumber, paper & cloth.**
- 2- Animal & human diseases.**
- 3- Plant diseases.**
- 4- Spoilage of vegetables & cereals.**
- 5- Toxins production.**

Classification of Fungi

Morphological

1- Yeast:

- Oval or rounded.
- Multiply by budding.

Ex: *Candida albicans*.

2- Mold / Filamentous fungi:

- Have branching filaments (hyphae).
- They may be septate or non septate.
- Ex: *Dermatophytes & Aspergillus*.

3- Dimorphic fungi: occurs in 2 forms:

- Yeast form in tissues (at 37 C).
- Filamentous form in culture & environment (at 25 C).
- Ex: *Histoplasma capsulatum*.
- *Coccidioides immitis*.

Clinically

1- Superficial mycosis:

- Involves stratum corneum without tissue invasion.
- Ex: *Taenia versicolor*.

2- Cutaneous mycosis:

- Involves skin, nail & hair with tissue destruction.
- Ex: *Dermatophytes & Candida*.

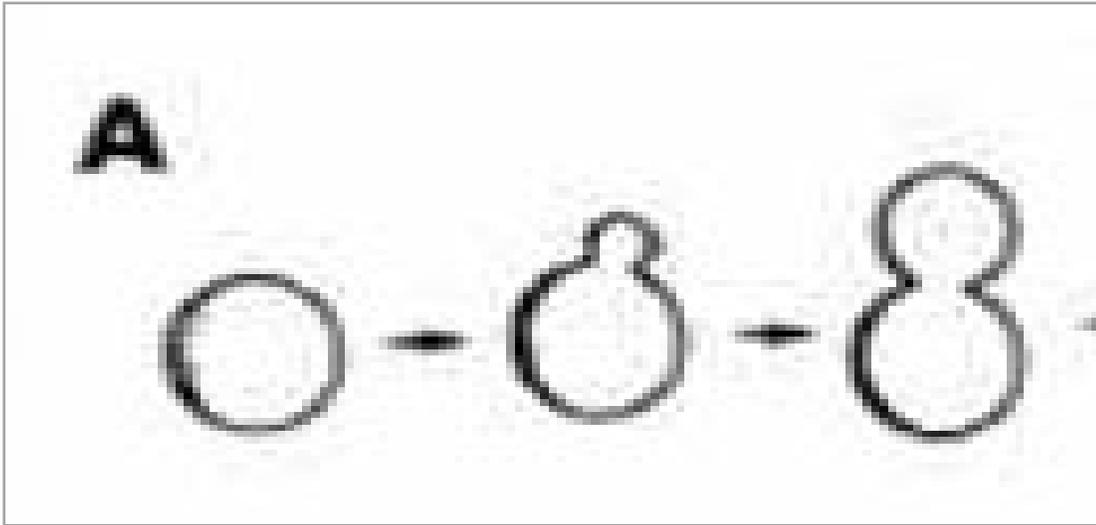
3- Subcutaneous mycosis:

- Involves the subcut. tissues, ms & fascia.
- initiated by trauma. Ex. *madura foot*.

- **4- Systemic:** primarily infects the lungs & can be disseminated to different organs.

Ex: - **Primary pathogens:** as *Histoplasma* & *Coccidioides*.

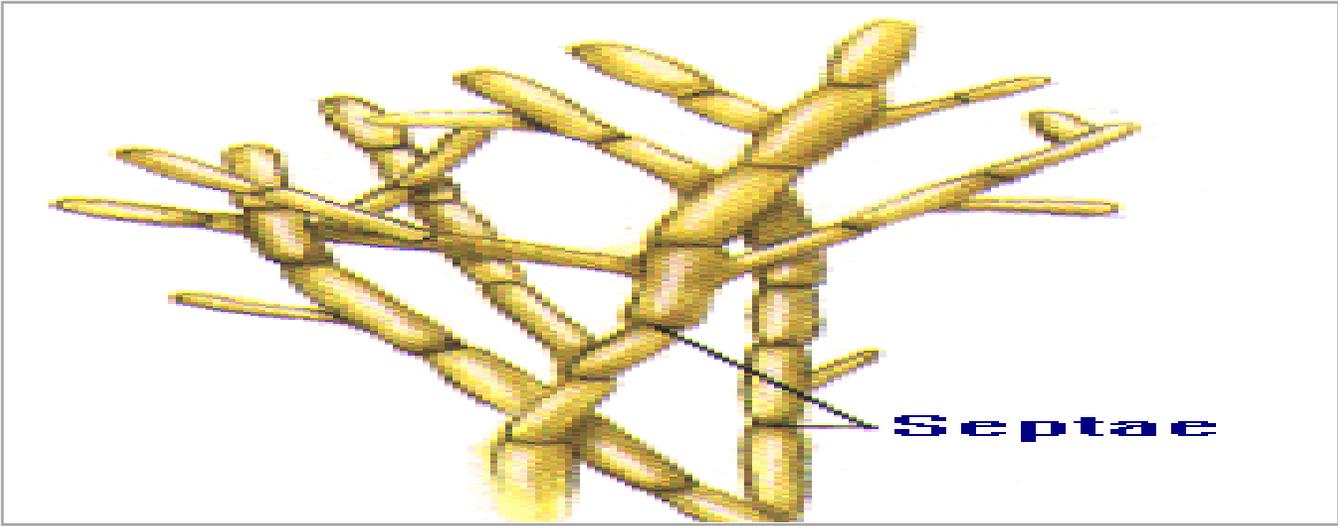
- **Opportunistic fungi** as *Aspergillus* & *Pneumocystis*.



Yeast form



Filamentous form



Septate hyphae

Diagnosis

1- Direct Microscopic Examination:

- KOH mount.
- Gram stain.
- Giemsa stain.
- Calcofluor white stain.
- India ink.

2- Culture:

- Sabouraud dextrose agar (SDA): either incubated at:
 - 37 C → Body temperature for growth of yeast.
 - 25 C → Room temperature for growth of mold.

Schistosomiasis

Definition

- Schistosomiasis is a chronic and potentially lethal tropical disease, mainly caused by the parasitic blood flukes.
- With untreated infections generally the infection can persist for 3–10 years and a minority of infected individuals developing life-threatening pathology .

S. haematobium

**Inhabits urogenital
veins**

Schistosoma species

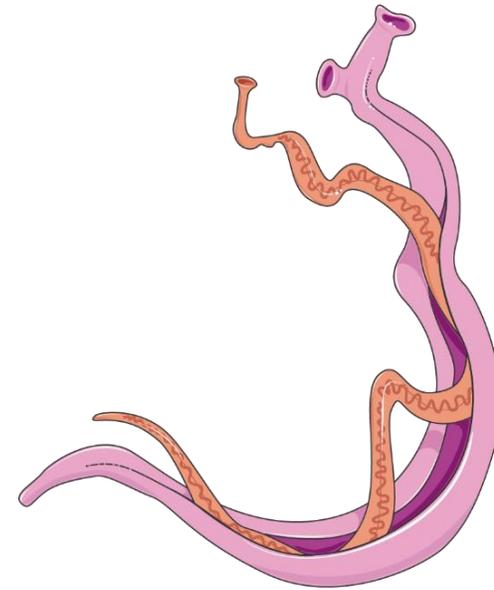
S. mansoni

**Inhabits inferior
mesenteric vein
(large intestine)**

S. Japonicum

**Inhabits superior &
inferior mesenteric
veins (small and
large intestine)**

Trematodes (Flukes)

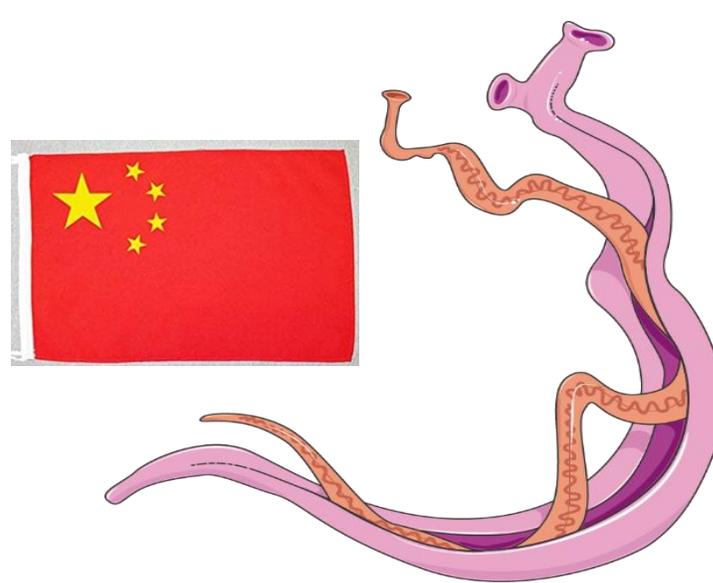


	Flukes	Schistosomes
Shape	Flat and leaf-shaped	Elongated and cylindrical
Sexes	hermaphroditic	Separate sexes
Egg	operculated	Nonoperculated
Transmission	ingestion	Skin penetration
Infective stage	metacercaria	Cercaria
Intermediate host	2	1

Schistosomes (Blood flukes)



Trematoda (flukes)



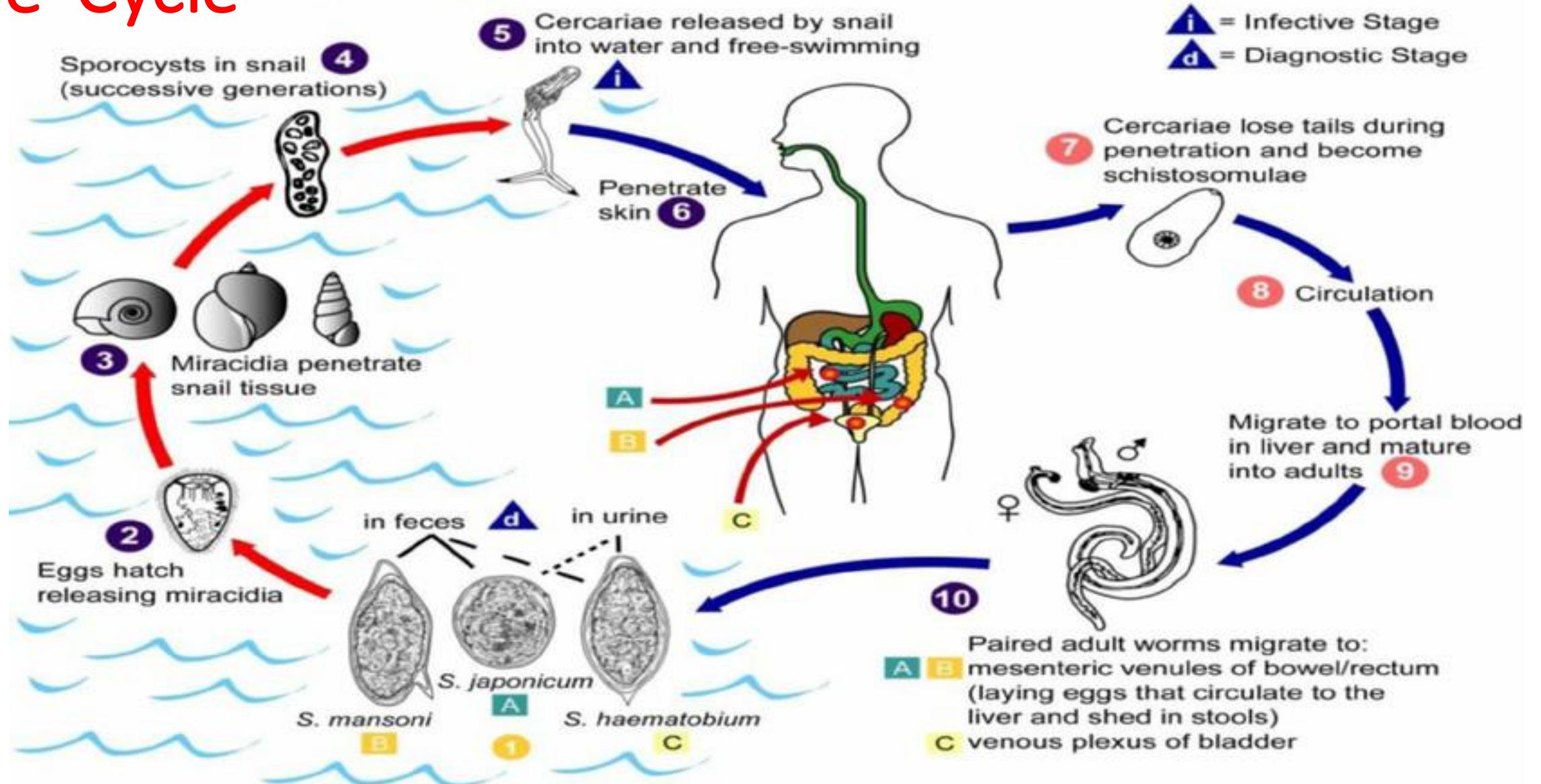
S. Japonicum



S. mansoni
(Nile delta)

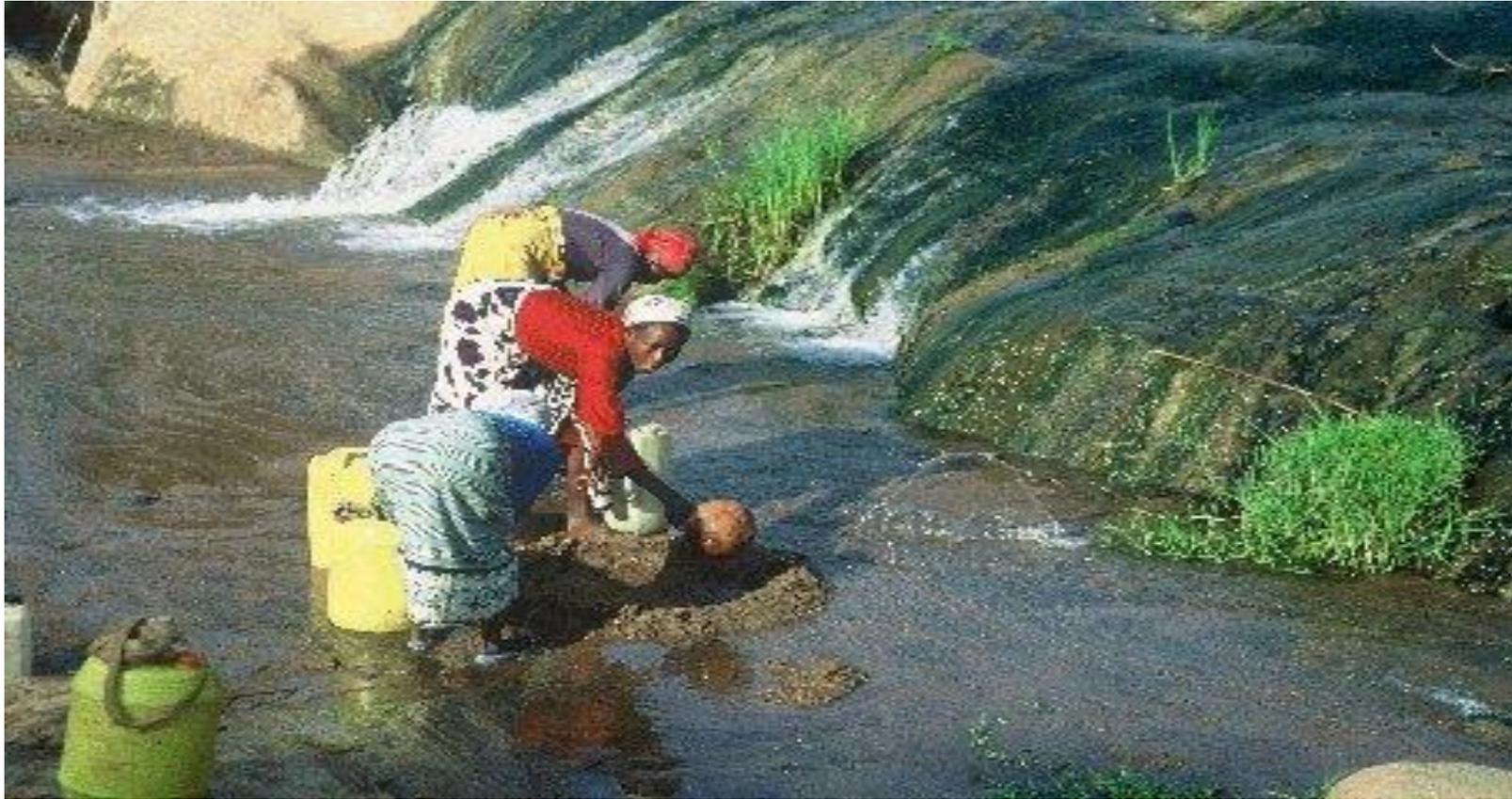
Schistosomiasis (Bilharziasis)

Life Cycle



Schistosomiasis (Bilharziasis)

Mode of infection



Man is infected by coming in contact with cercaria in polluted water of canals or drinking polluted canals water containing cercaria. The cercaria actively penetrates the skin or the mucous membrane through the action of penetration glands