Ministry of Higher Education and Scientific Research

Al -Mustaqbal University

Collage of medical and health techniques

Department of medical laboratories techniques

4TH LECTURE

Phylum , Protozoa , Plasmodium Fungi

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4.1. Phylum: *Protozoa*

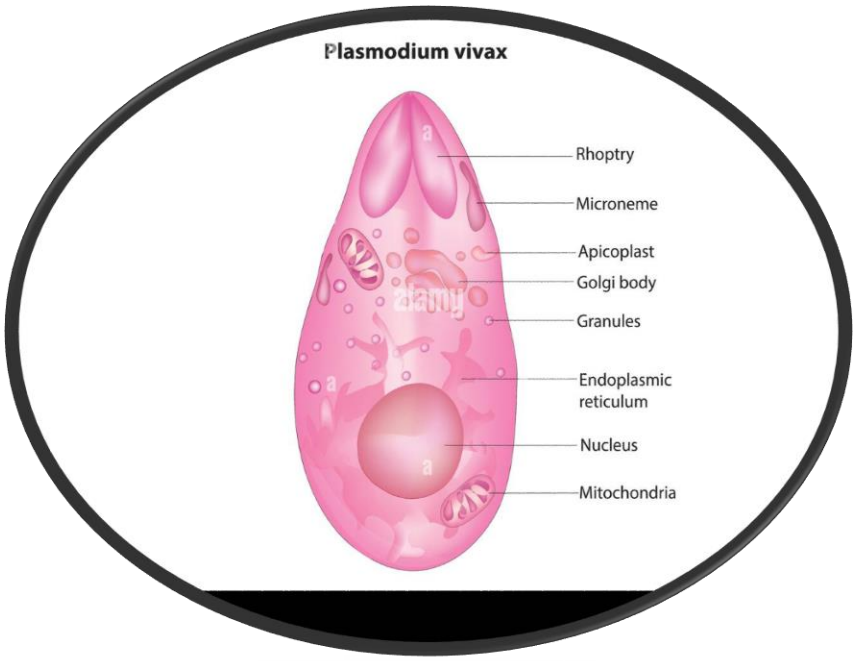
A protozoan is a group of unicellular, intracellular parasites responsible for causing various diseases in humans and other animals. They are characterized by their complex life cycles, which involve two hosts and alternating sexual and asexual stages. These organisms are non-motile and spore-forming, and some of the most well-known examples include Malaria parasites

Kingdom: Protista
Subkingdom: Protozoa
Phylum: Sarcomastigophora
Class: Ampicomplexa (sporozoa)
Order: Eucoccida
Family: Plasmodidae
Genus:Plasmodiumvivax
Plasmodium malaria
Plasmodium ovale
Plasmodium falsiparm malaria

Plasmodium (Malaria)

Malaria is one of the most devastating infectious diseases of humans. It is problematic clinically and economically as it prevails in poorer countries and regions, strongly hindering socioeconomic development. The causative agents of malaria are unicellular protozoan parasites belonging to the genus *Plasmodium.* These parasites infect not only humans but also other vertebrates, from reptiles and birds to mammals. To date, over 200 species of *Plasmodium* have been formally described, and each species infects a certain range of hosts. *Plasmodium* species that naturally infect humans and cause malaria in large areas of the world are limited to five—*P. falciparum*, *P. vivax*, *P. malariae*, *P. ovale* and *P. knowlesi*. The first four are specific for humans, while *P. knowlesi* is naturally maintained in macaque monkeys and causes zoonotic malaria widely in South East Asia. Transmission of *Plasmodium* species between vertebrate hosts depends on an insect vector, which is

usually the mosquito. The vector is not just a carrier but the definitive host, where sexual reproduction of *Plasmodium* species occurs, and the parasite's development in the insect is essential for transmission to the next vertebrate host.



Life Cycle:

Human cycle

Exoerythrocytic stage -Schizogony:

Human infection results from the bite of infected female Anopheles mosquito, through which the sporozoites are injected into the bloodstream. The sporozoites rapidly (usually within 1 hour) enter parenchymal cells of the liver, where the first stage of development in humans takes place. Subsequently, numerous asexual progeny, the merozoites, rupture and leave the liver cells, enter the bloodstream, and invade erythrocytes. The merozoites do not return from red blood cells to liver cells.

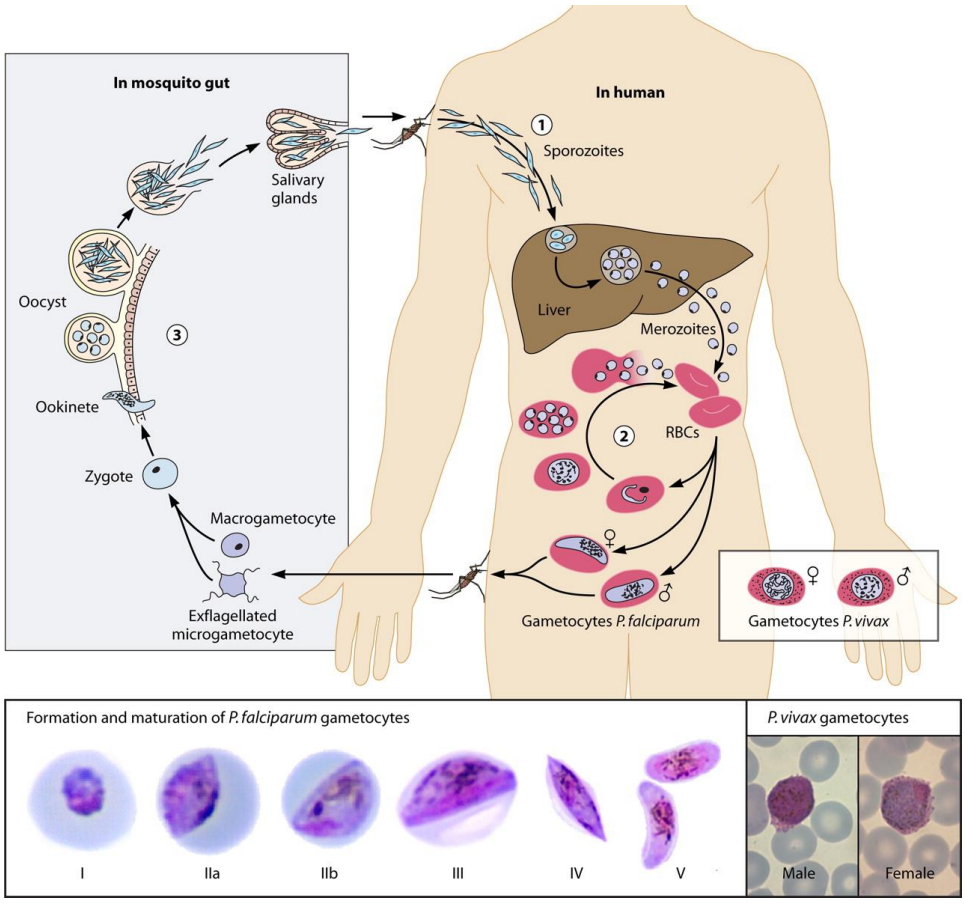
2 Erythrocytic cycle:

merozoites in the red cells multiply in a species characteristic fashion, breaking out of their host cells synchronously, with successive broods of merozoites appearing at 48-hour intervals (*P*

vivax, P falciparum, and P ovale) or every 72 hours (P malariae). The digestion of red cell hemoglobin, which is transformed into malaria pigment certain merozoites enter red cells and become differentiated as male or female gametocytes.

Mosquito cycle Sporogony:

The gametocytes, male (microgametocytes) and female (macrogametocytes), are ingested by an Anopheles mosquito during a blood meal (only mature sexual forms are capable of further development and rest die). In the mosquito's stomach, from one microgametocye eight microgametes are formed by the process called exflagellation. The macrogametocyte does not show exflagellation, it developes into a macrogamete. Fertilization occur when the microgametes penetrate the macrogametes generating zygotes.



Site of infection: Red blood cell and Liver tissue cell
Plasmodium requires two hosts:

-Definitive invertebrate host: (vector Anopheles mosquitoes female).
-Intermediate vertebrate host: (mammals, birds and lizards).

Symptoms:

- ❖ Fever: Often irregular. The regular pattern of fever does not occur until the illness has
- ❖ continued for a week or more.
- ❖ Anemia: The anemia is hemolytic in type. It is more severe in infections with P.
- ❖ falciparum because in this infection cells of all ages can be invaded.
- ❖ Splenomegaly: The spleen enlarges early in the acute attack of malaria.
- ❖ Jaundice: due to hemolysis may occur in malaria.

Diagnosis:

1-Thin blood films stained with Giemsa stain.
2-Antibody test.

4.2. fungi

Fungi are eukaryotic organisms that include microorganisms such as yeasts, moulds and mushrooms.
To name a few – the appearance of black spots on bread left outside for some days, the mushrooms and the yeast cells, which are commonly used for the production of beer and bread are also fungi. They are also found in most skin infections and other fungal diseases.

If we observe carefully, all the examples that we cited involve moist conditions. Thus, we can say that fungi usually grow in places which are moist and warm enough to support them.

Classification of Fungi

Kingdom Fungi are classified based on different modes. The different classification of fungi is as follows:

kingdom fungi can be classified into 3 groups.

1. **Saprophytic**
   The fungi obtain their nutrition by feeding on dead organic substances. Examples: *Penicillium* and *Aspergillus*.
2. **Parasitic**
   The fungi obtain their nutrition by living on other living organisms (plants or animals) and absorb nutrients from their host. Examples: *Taphrina*
3. **Symbiotic**
   These fungi lives by having an interdependent relationship with other species in which both are mutually benefited. Examples: Lichens and mycorrhiza. Lichens are the symbiotic association between algae and fungi. Here both algae and fungi are mutually benefited as fungi provide shelter for algae and in reverse algae synthesis carbohydrates for fungi. Mycorrhiza is the symbiotic association present between fungi and plants. Fungi improve nutrient uptake by plants, whereas, plants provides organic molecules like sugar to the fungus.

Reproduction

in fungi is both by sexual and asexual means

Vegetative reproduction in fungi

This takes place by budding, fission and fragmentation.

Asexual reproduction

This takes place with the help of spores called conidia or zoospores, or sporangiospores.

Sexual reproduction

This occurs by ascospores, basidiospores, and oospores.