Tikrit University

College of Nursing

Basic Nursing Sciences

Second Year - 2023-2024

Microbiology

Sporozoa

By: assistant lecturer

Ayat Munaf Hameed

SPOROZOA

INTRODUCTION

Coccidia are members of the class sporozoa, Phylum Apicomplexa. Apical complex is present at some stage and consists of elements visible with electron microscope. The life cycle is characterized by an alternation of generations, i.e. sexual (gametogony) and asexual (schizogony) reproduction and most members of the group also share alternative hosts. The locomotion of a mature organism is by body flexion, gliding, or undulation of longitudinal ridges. The genus Plasmodium that are the causes of malaria is the prototype of this class.

Malaria

There are four species normally infecting humans, namely, Plasmodium falciparum, Plasmodium vivax, Plasmodium ovale, and Plasmodium malariae.

Life cycle

The life cycle of malaria is passed in two hosts (alternation of hosts) and has sexual and asexual stage (alternation of generations). Vertebrate host - man (intermediate host), where the asexual cycle takes place. The parasite multiplies by schizogony and there is formation of male and female gametocytes (gametogony). Invertebrate host - mosquito (definitive host) where the sexual cycle takes place. Union of male and female gametes ends in the formation of sporozoites (sporogony). The life cycle passes in four stages: Three in man:

- Pre - erythrocytic schizogony

- Erythrocytic schizogony

- Exo- erythrocytic schizogony One in mosquito - Sporogony Introduction into humans - when an infective female Anopheles mosquito bites man, it inoculates saliva containing sporozoites (infective stage).

Pre- Erythrocytic schizogony - sporozoites reach the blood stream and within 30 minutes enter the parenchymal cells of the liver, initiating a cycle of schizogony. Multiplication occurs in tissue schizonts, to form thousands of tiny merozoites. Merozoites are then liberated on rupture of schizonts about 7th – 9th day of the bites and enter into the blood stream. These merozoites either invade the RBC's or other parenchymal liver cells. In case of P. falciparum and possibly P. malariae, all merozoites invade RBC's without re-invading liver cells. However, for P. vivax and P. ovale, some merozoites invade RBC's and some re-invade liver cells initiating further Exo-erythrocytic schizogony, which is responsible for relapses. Some of the merozoites remain dormant (hypnozoites) becoming active later on.

Erythrocytic schizogony (blood phase) is completed in 48 hrs in P. vivax, P. ovale, and P. falciparum, and 72 hrs in P. malariae. The merozoites reinvade fresh RBC's repeating the schizogonic cycles

Erythrocytic merozoites do not reinvade the liver cells. So malaria transmitted by blood transfusion reproduces only erythrocytic cycle

Gametogony

Some merozoites that invade RBC's develop into sexual stages (male and female gametocytes). These undergo no further development until taken by the mosquito.

Sporogony (extrinsic cycle in mosquito)

When a female Anopheles mosquito vector bites an infected person, it sucks blood containing the different stages of malaria parasite. All stages other than gametocytes are digested in the stomach.

The intermediate host: Man, inside the liver cells and RBCs.

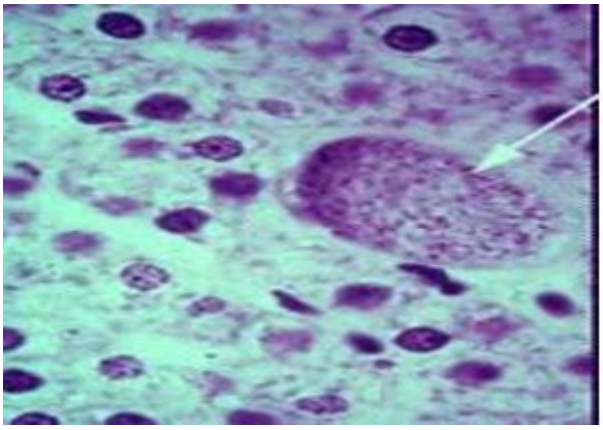
1- Exo - erythrocytic schizogony In the liver cells: merozoites (within schizont) will formed, which either infect another liver cells or RBCs.

2- Erythrocytic schizogony cycle: asexual replication of parasite inside the RBCs

later mature stage developed to schizont which contain merozoite, which either develop to trophozoite or to gametocyte.

Exo-Erythrocytic schizogonIn

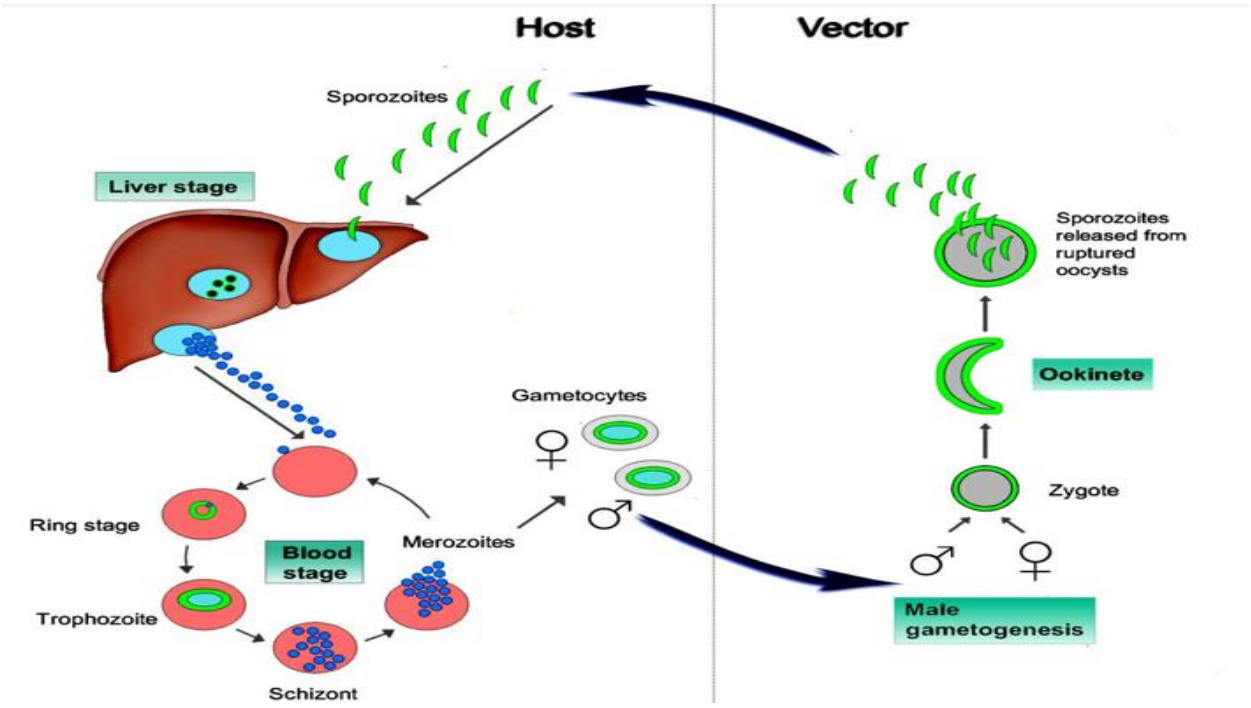
the liver cells

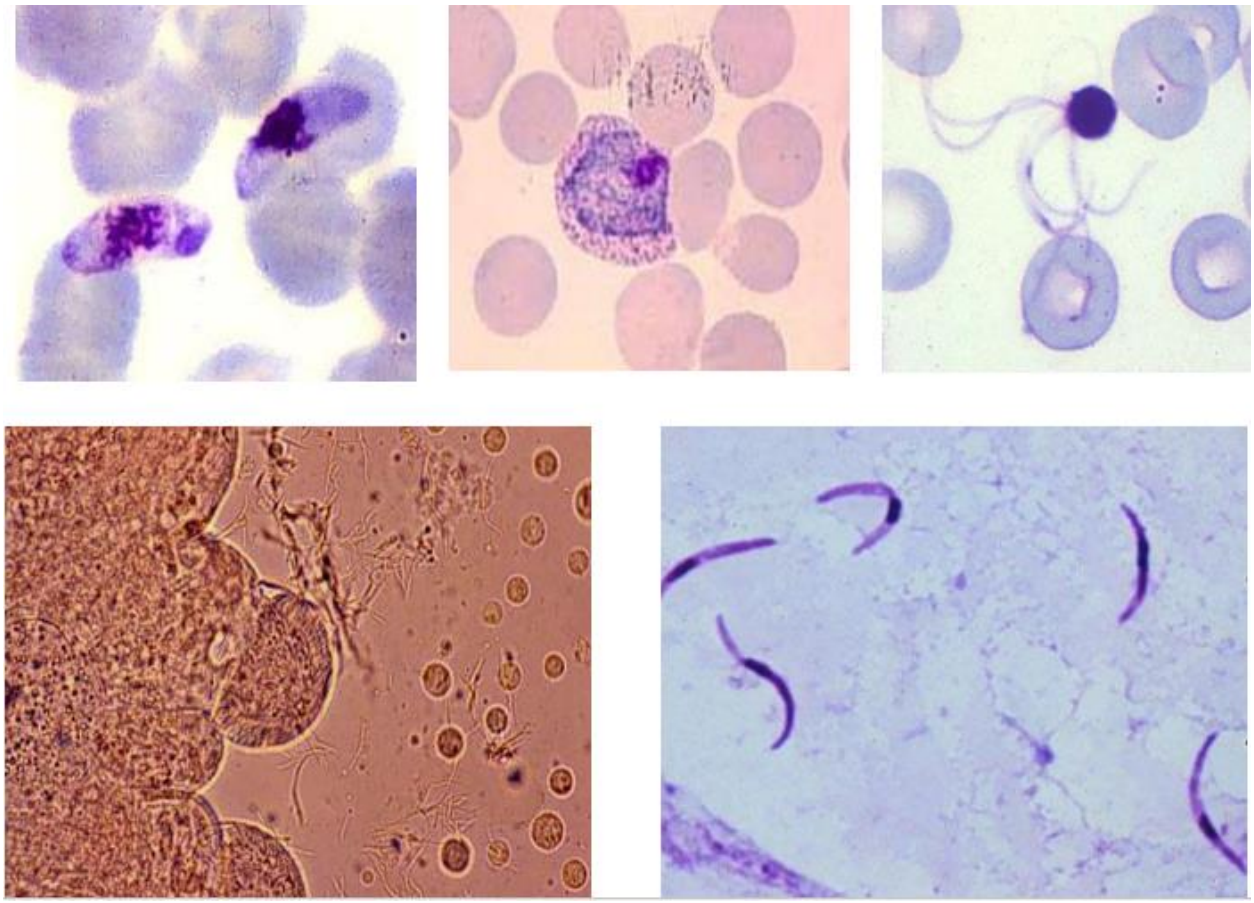


Sexual life cycle

Sexual life cycle occur inside the mosquitoes called sporogony life cycle (producing of sporozoites).

Sexual life cycle inside the vector, male gametocyte (microgametocyte) fertilize the female gametocyte (macrogametocyte) to form zygote, which developed to oocyst containing numerous of sporozoites.





Toxoplasma gondii – causes toxoplasmosis. The definitive host is the domestic cat and other felines. Humans and other mammals are intermediate hosts. T.gondii is usually acquired by ingestion and transplacental transmission from an infected mother to the fetus can occur. Human–to–human transmission, other than transplacental transmission, does not occur. After infection of the intestinal epithelium, the organisms spread to other organs, especially the brain, lungs, liver, and eyes. Most primary infections in immunocompetent adults are asymptomatic. Congenital infection can result in abortion, stillbirth, or neonatal disease with encephalitis, chorioretinitis and hepatosplenomegaly. Fever, jaundice, and intracranial calcifications are also seen. For the diagnosis of acute and congenital infections, an immunofluorescence assay for detection of antibody is used. Microscopic examination of Giemsa–stained preparations shows crescent–shaped trophozoite. Cysts may be seen in the tissue. Treatment is with a combination of sulfadiazine and pyrimethamine.

Infective stage: fecal oocyst from cats , or tissue cyst from cattle

Rout of infection: Mouth, placenta.

Diagnosis: serological technique to estimate the level of IgG (for old infection) and IgM (for new infection).