

PLASMODIUM

① Describe the life history of Malaria Parasite?
or

Describe in detail the life history of any blood-dwelling protozoan parasite you have studied

Ans:- INTRODUCTION:-

1) The Malaria Parasite (Plasmodium) is an intracellular blood parasite of man & other vertebrates and is digenetic in habit.

2) In its life-history, it comprises two hosts; the man as the Primary or definitive host and the female Anopheles as a secondary or intermediate host.

3) Members of the genus Plasmodium are collectively known as Malaria parasites because they cause a chill & febrile disease, Malaria; known to mankind for a long time.

Historical Background :-

1) Charles Laveran in 1880 discovered it in the red blood cells of a patient suffering from this chill and fever disease.

He found the presence of some amoeba-like organisms and termed them Plasmodium.

2) Its connection with intermediate host & modes of transmission were experimentally worked out in Calcutta by Nobel prize winner (1902) Sir Ronald Ross in 1889,

And it was Grassi (1890) who provided absolute scientific proof of the specific relationship between Anopheles mosquito and the human Malaria parasite.

SYSTEMATIC POSITION:-

Phylum :- Protozoa

Sub-Phylum :- Plasmodium

Class :- Sporozoa

Order :- Haemosporidia

Family :- Plasmodidae

Genus :- Plasmodium

Species :- *P. vivax*

SPECIES :-

About 60 species of Plasmodium are known to cause malaria in reptiles, birds and mammals. But only 4 distinct species are recognised infecting man & causing different kinds of malaria. These are :-

a) *P. malariae* (Laveran, 1881; Grassi & Feletti 1890)

b) *P. vivax* (Grassi & Feletti, 1890)

c) *P. falciparum* (Welch, 1897)

d) *P. ovale* (Stephens, 1922)

➤ GEOGRAPHICAL DISTRIBUTION :-

➤ Malaria Parasites are found widely spread from 40° S to 63° N latitudes. Their endemic home is in the tropical zone, but they also occur in many temperate countries.

2) Of the four human infecting species, *P. vivax* is the most widespread and prevailing sps. of the temperate region; *P. falciparum* is confined to the warmer countries only; *P. malariae* occur in the sub-tropical zone; while *P. ovale*, the rarest of the four, has been reported from the Philippines and the East & West Africa, especially Nigeria.

LIFE CYCLE OF PLASMODIUM VIVAX :-

Though Plasmodium is digenetic, its life cycle is distinguished into two phases:-

A ENDOGENOUS or ASEXUAL PHASE :-

Asexual cycle is passed in man. The parasite occurs inside the liver cells & the RBC and reproduces by asexual method, called SCHIZOGONY. The end product of Schizogony is called a merozoite.

B EXOGENOUS or SEXUAL PHASE :-

Sexual cycle is passed in the female Anopheles mosquito. The parasite reproduces by sexual method, called SPOROLOGY, in the gut wall of the mosquito.

[A] ASEXUAL CYCLE OF P. vivax IN MAN :-

The life cycle of Plasmodium in man can be studied under the following heads:-

① INFECTION or TRANSMISSION or INOCULATION:-

(a) Human cycle begins with the introduction of sporozoites when an infected female anopheles mosquito bites a healthy person to obtain ^(blood) food. Numerous sporozoites enter into blood stream along with saliva.

(b) The blood clotting is checked by the Saliva which is anti-coagulant.

② SPOROZOITES :-

(a) The Sporozoites represent the infective stage of the parasite. They are minute, slightly curved or sickle-shaped bodies with tapering ends.

(b) They are motile creatures performing vibratory and gliding movements.

© Each sporozoite is about 14μ long and 1μ broad and covered with an elastic but somewhat resistant cuticle; the Pellicle which enables it to maintain more or less definite shape.

④ Its thicker central part contains a nucleus.

③ LIVER SCHIZOGONY :-

Shortt (1948), Garnham (1954) & others have shown that about half an hour after the infection (mosquito-bite) the parasites (sporozoites) totally disappear from the blood stream and enter the parenchymatous cells of liver.

Here they multiply asexually by schizogony, liver schizogony includes the following phases:—

EXO-ERYTHROCYTIC CYCLE :-

This cycle starts with schizogony. This cycle is further distinguished into 2 cycles:

⑤ PRE-ERYTHROCYTIC CYCLE :-

① The sporozoites on entering the liver cells become spherical and are known as CRYPTOZOITES.

② Each cryptozoite feeds upon the cytoplasm of liver cell. increases in size and finally forms a multinucleate SCHIZONT.

③ The nucleus of the schizont divides by repeated schizogony and forms about 1,000 CRYPTOMEROZOITES. These are liberated in the liver sinusoids completing the pre-erythrocytic cycle.