Class: Sporozoa (Coccidia)

MALARIA

Class One : Sporozoa (Coccidia)

order : Haemosporida : include blood species

- ***Plasmodium spp.***
- ***Babesia sp.***

order : Eucoccida : include intestinal and tissue species

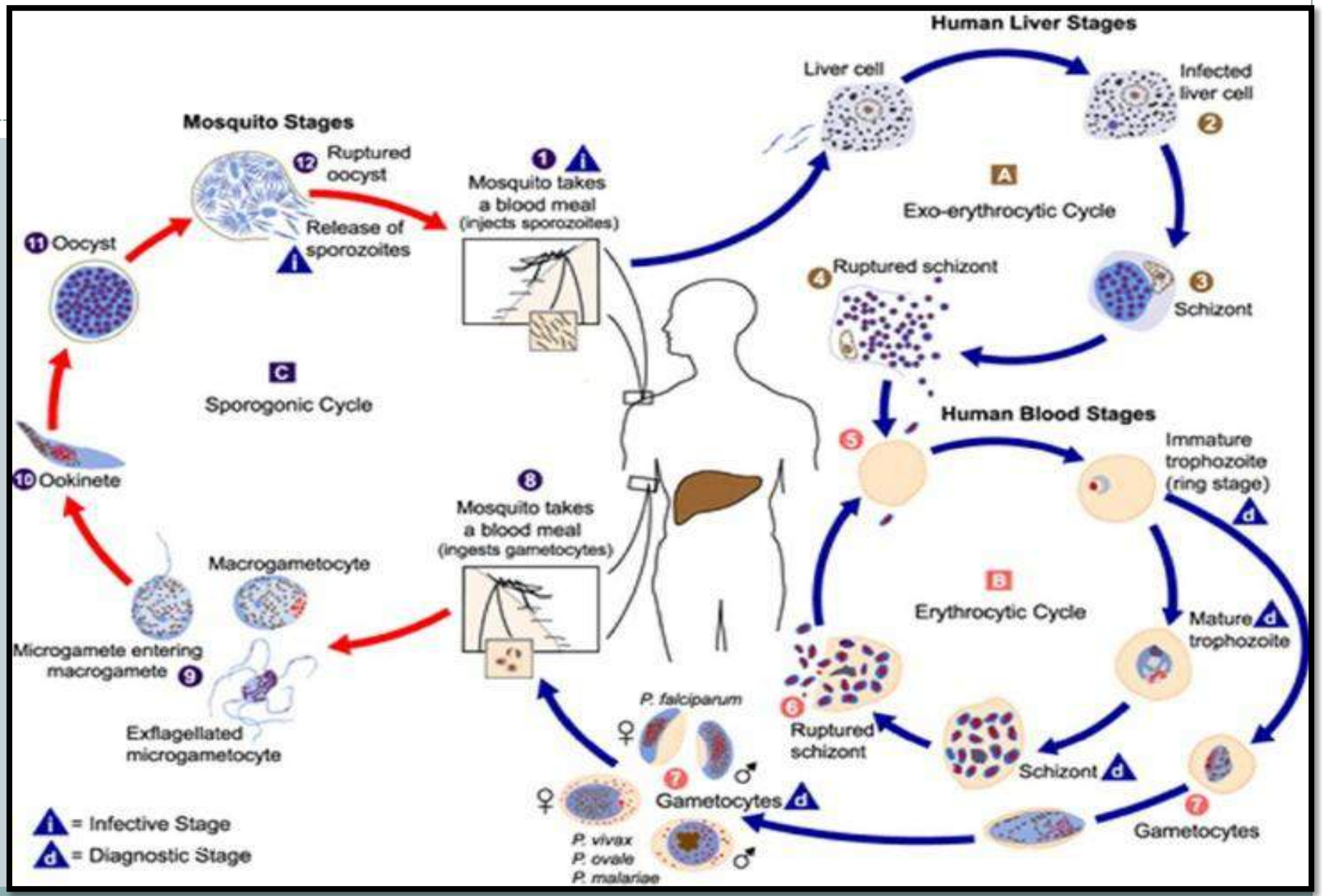
- ***Toxoplasma gondii* (tissue species)**
- ***Isospora belli***
- ***Cyclospora sp.***
- ***Cryptosporidium parvum***
- ***Sarcocystis sp*.(tissue species)**
- ***Microsporidia sp.***

MALARIA

- 40% of the world's population lives in endemic areas
- 3-500 million clinical cases per year
- 1.5-2.7 million deaths (90% Africa)
- increasing problem (re-emerging disease)
  - resurgence in some areas
  - drug resistance (↑ mortality)
- causative agent = *Plasmodium* species
  - protozoan parasite
  - member of Apicomplexa
  - 4 species infecting humans
- transmitted by anopholine mosquitoes

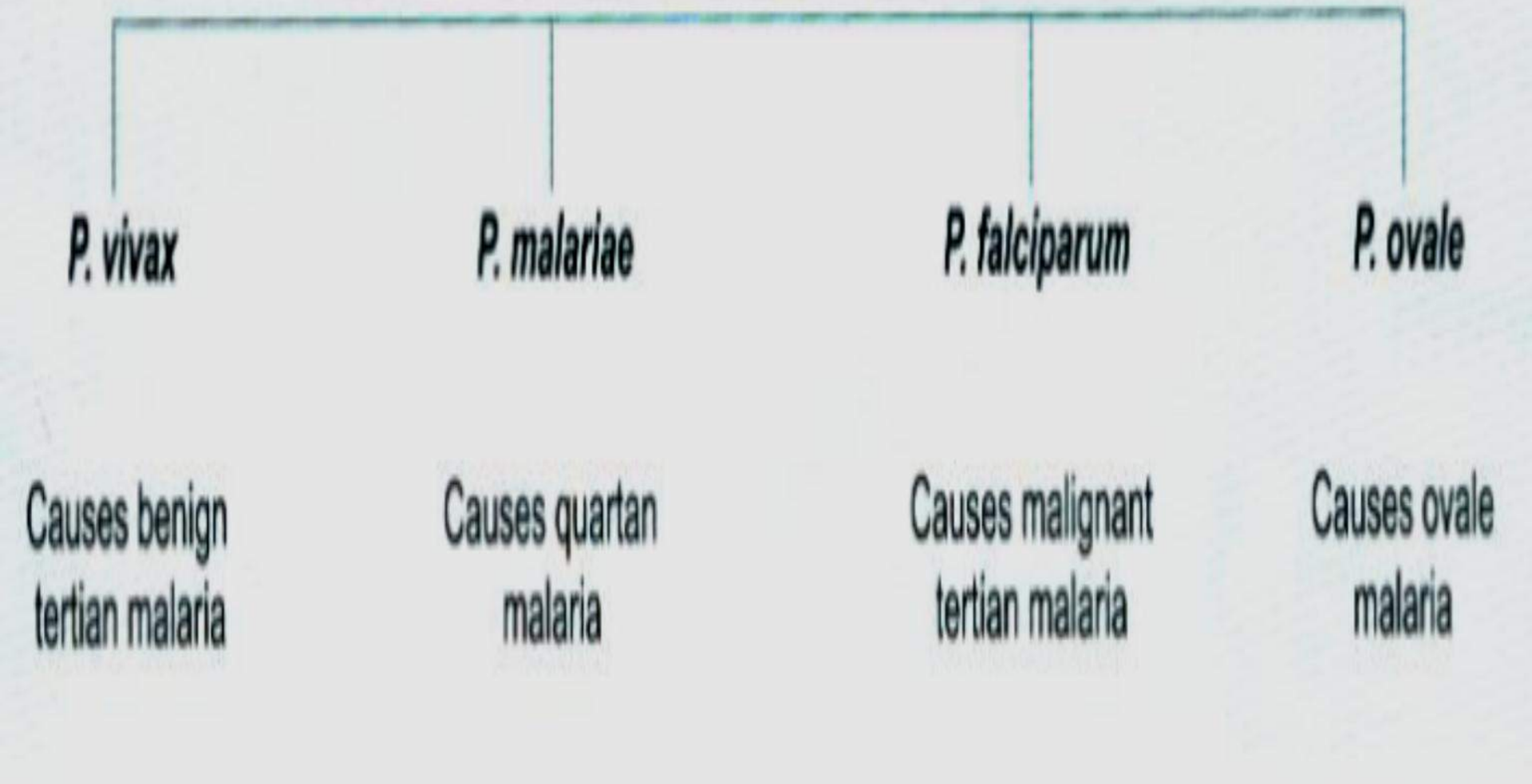
- *P. falciparum*
- *P. vivax*
- *P. malariae*
- *P. ovale*

MALARIA – VECTORS


Human Liver Stages
Liver cell
Infected liver cell
2
A
Exo-erythrocytic Cycle
Ruptured schizont
4
3
Schizont
Human Blood Stages
5
Immature trophozoite (ring stage)
d
Mature trophozoite
B
Erythrocytic Cycle
6
Ruptured schizont
Schizont
d
7
Gametocytes
Gametocytes
d
P. falciparum
P. vivax
P. ovale
P. malariae
8
Mosquito takes a blood meal (ingests gametocytes)
Macrogametocyte
Microgamete entering macrogamete
9
Exflagellated microgametocyte
10 Ookinete
11 Oocyst
12
Ruptured oocyst
Release of sporozoites
Mosquito Stages
1
Mosquito takes a blood meal (injects sporozoites)
C
Sporogonic Cycle
= Infective Stage
= Diagnostic Stage

Plasmodium spp.

Malaria



Morphology

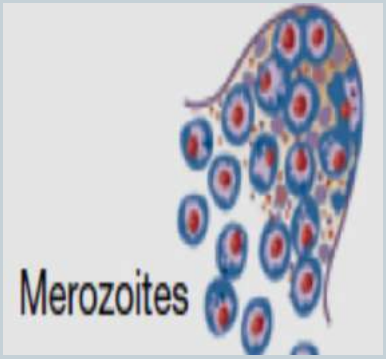

s
Ring-form
trophozoite


Growing
trophozoite

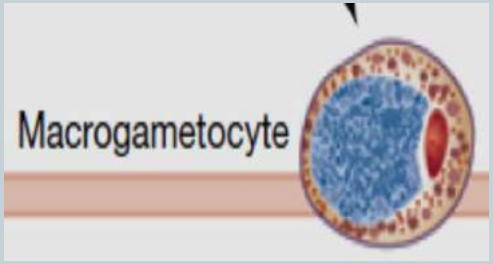

Mature
trophozoite


Immature
schizont


Mature schizont


Merozoites


Microgametocyte

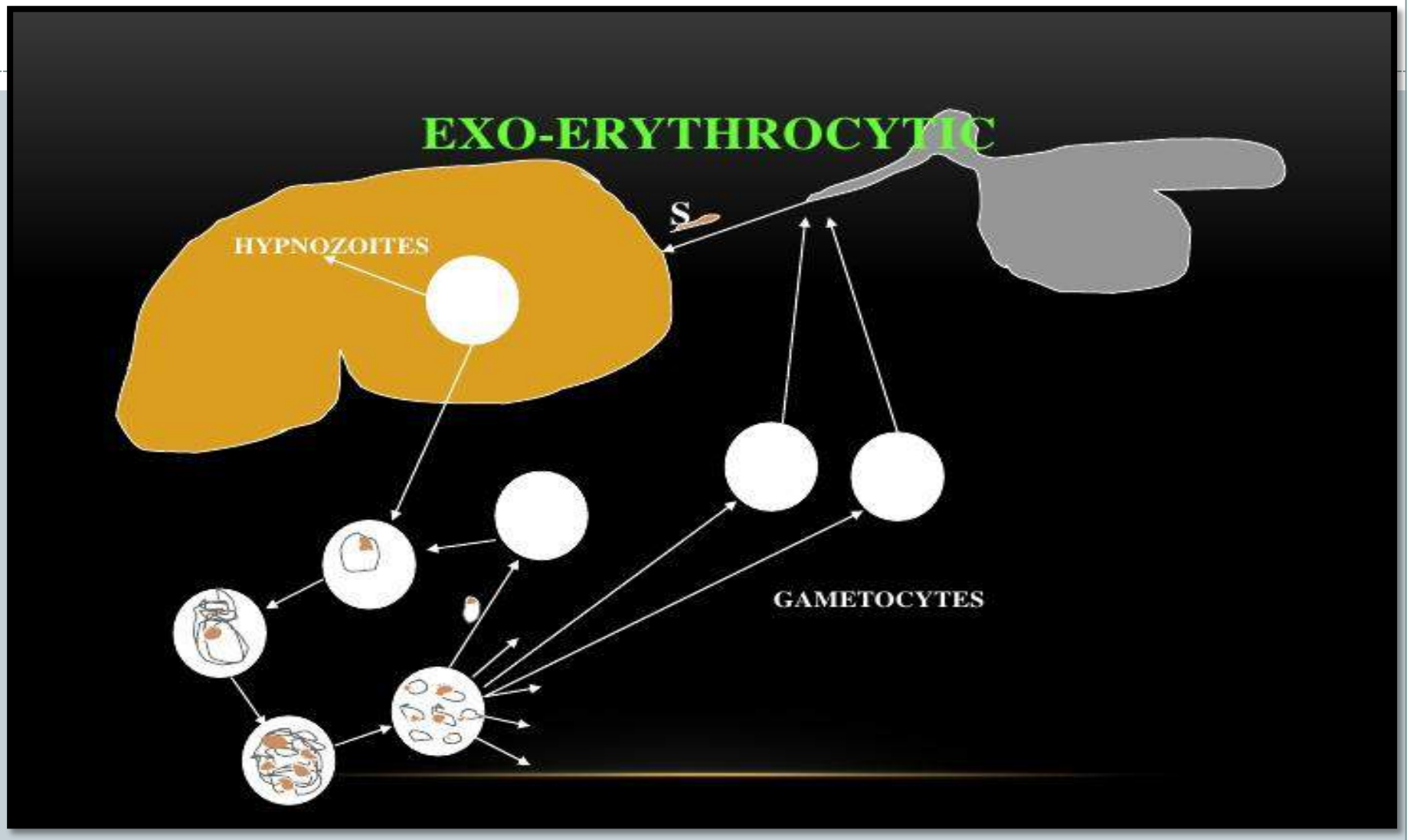

Macrogametocyte

Life cycle :

The life cycle of malaria is complex

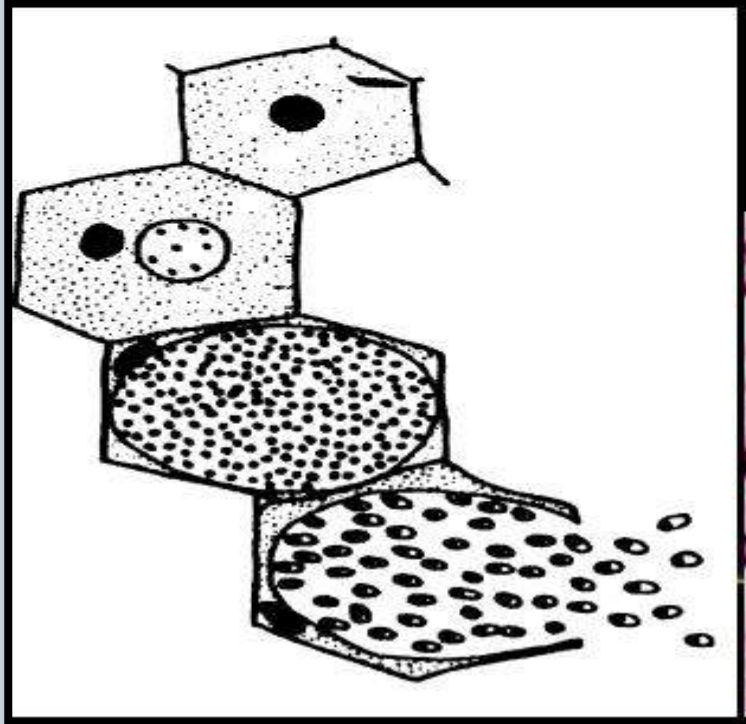
Vertebrate host - man (intermediate host),
Invertebrate host –mosquito of genus *Anopheles* (definitive host)
The life cycle passes in four stages:

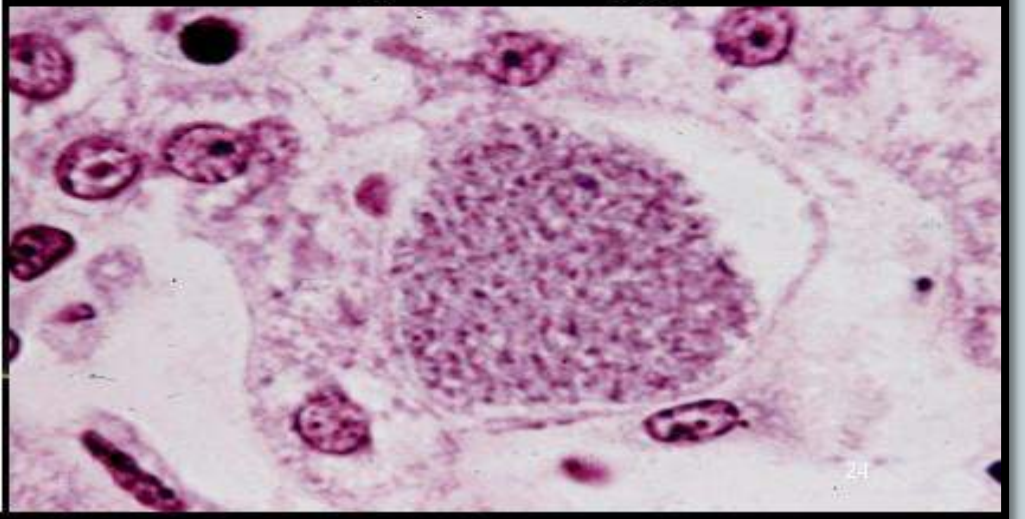
Three in man:-
- Pre (exo)- erythrocytic schizogony.
Erythrocytic schizogony.
Gametogony.
One in mosquito – Sporogony.


EXO-ERYTHROCYTIC
S
HYPNOZOITES
GAMETOCYTES

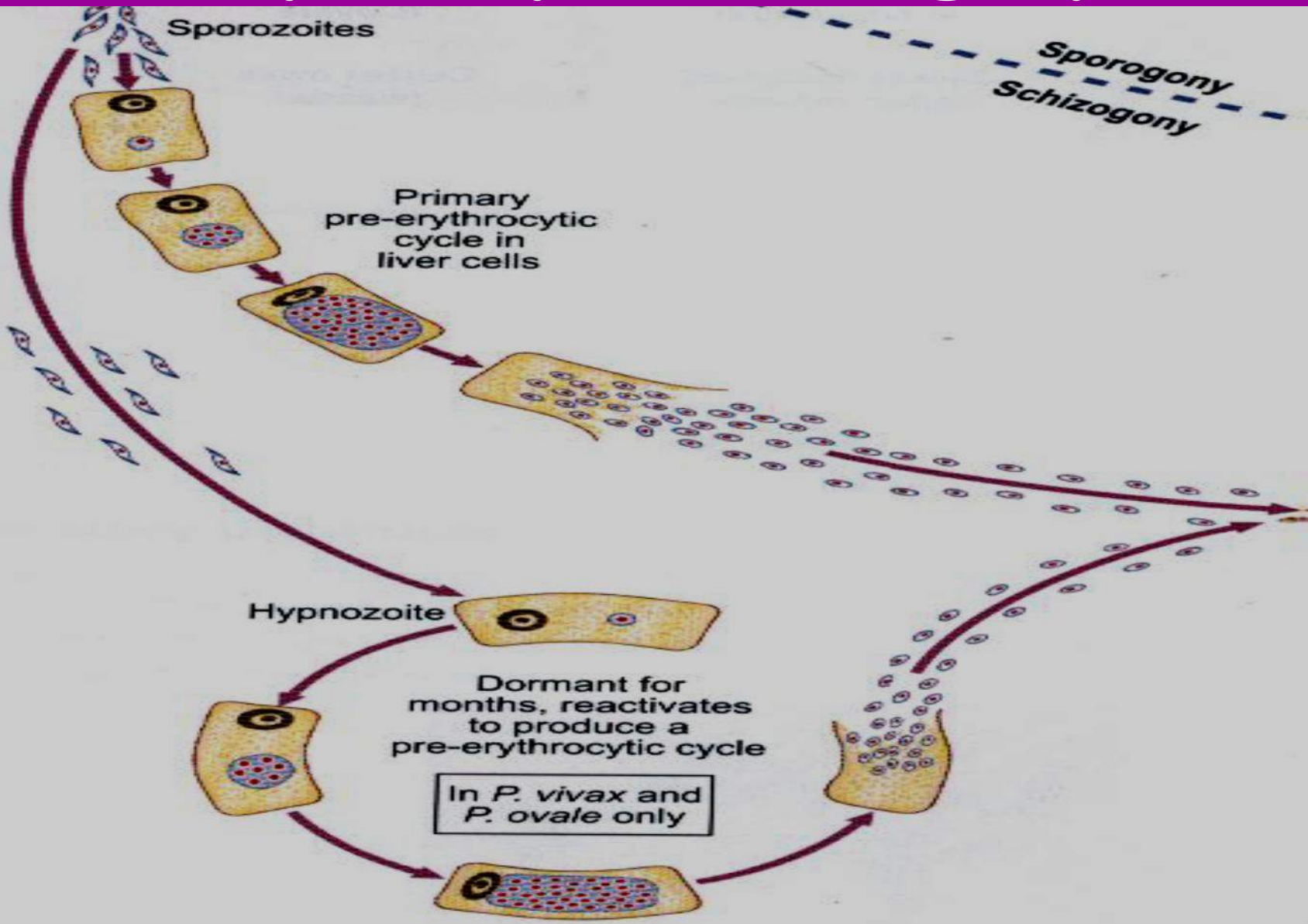
Exoerythrocytic Schizogony

- hepatocyte invasion
- asexual replication
- 6-15 days
- 1000-10,000 merozoites
- no overt pathology





Pre- erythrocytic schizogony



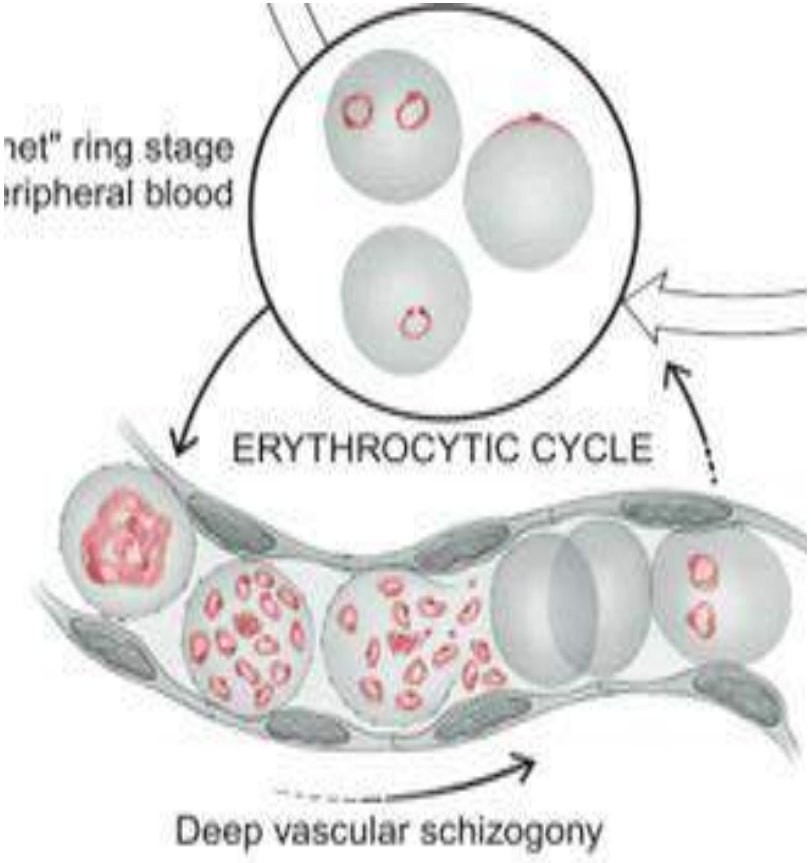
MALARIA

All the pathology associated with malaria caused by asexual multiplication of *plasmodia* in bloodstream (erythrocytic schizogony) . There are certain people, who are resistant to malaria infection, including those with:

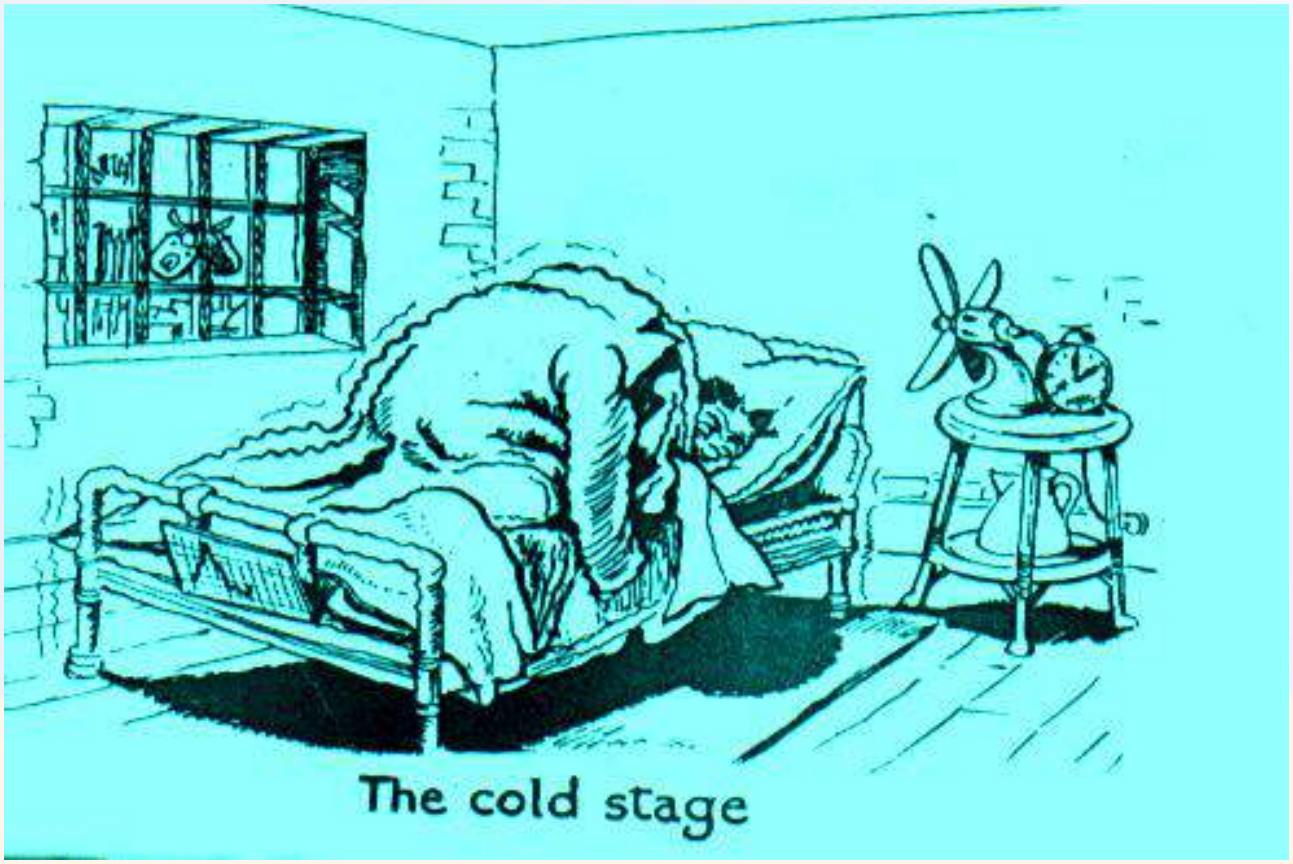
1. **Duffy antigen blood group negative (esp. for vivax).**
2. **Sickle cell traits.**
3. **Thalassemia.**
4. **Glucose-6-phosphate-dehydrogenase deficiency.**

After an incubation period of 12 days for *P.falciparum*, 13-17 days for *P.vivax*, and *P. ovale*, and 28-30 days for *P. malariae*, patient will develop typical picture of malaria that consists of: Febrile paroxysm, Anaemia, Splenomegaly and juandice .

Malaria

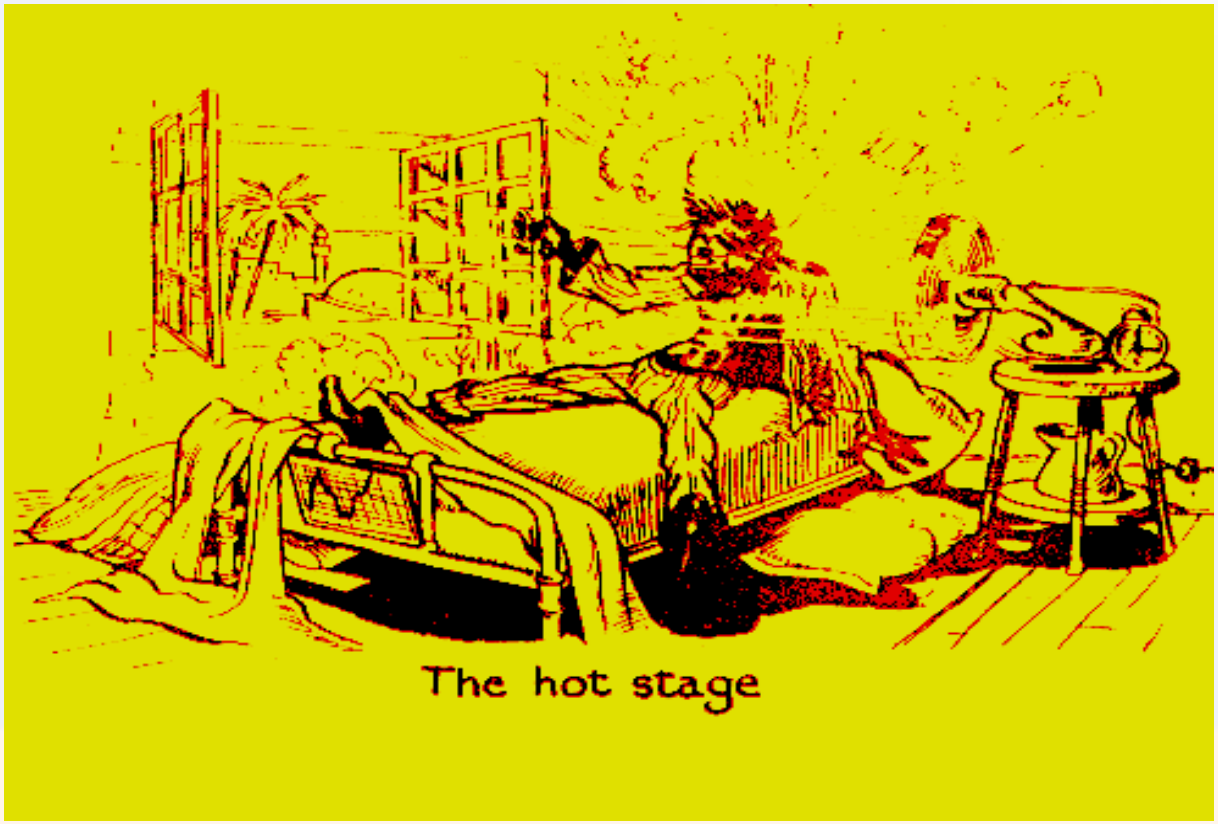

ring stage
peripheral blood
ERYTHROCYTIC CYCLE
Deep vascular schizogony

Malaria



Cold stage,15-60 min, the patient experiences intense cold and shivering

Malaria



Hot stage lasting for 2-6 hours, when the patient feels intense hot. Patient develops high fever (40-41.6 C), severe headache, nausea, and vomiting.