Plasmodium and *Babesia*

Presented by

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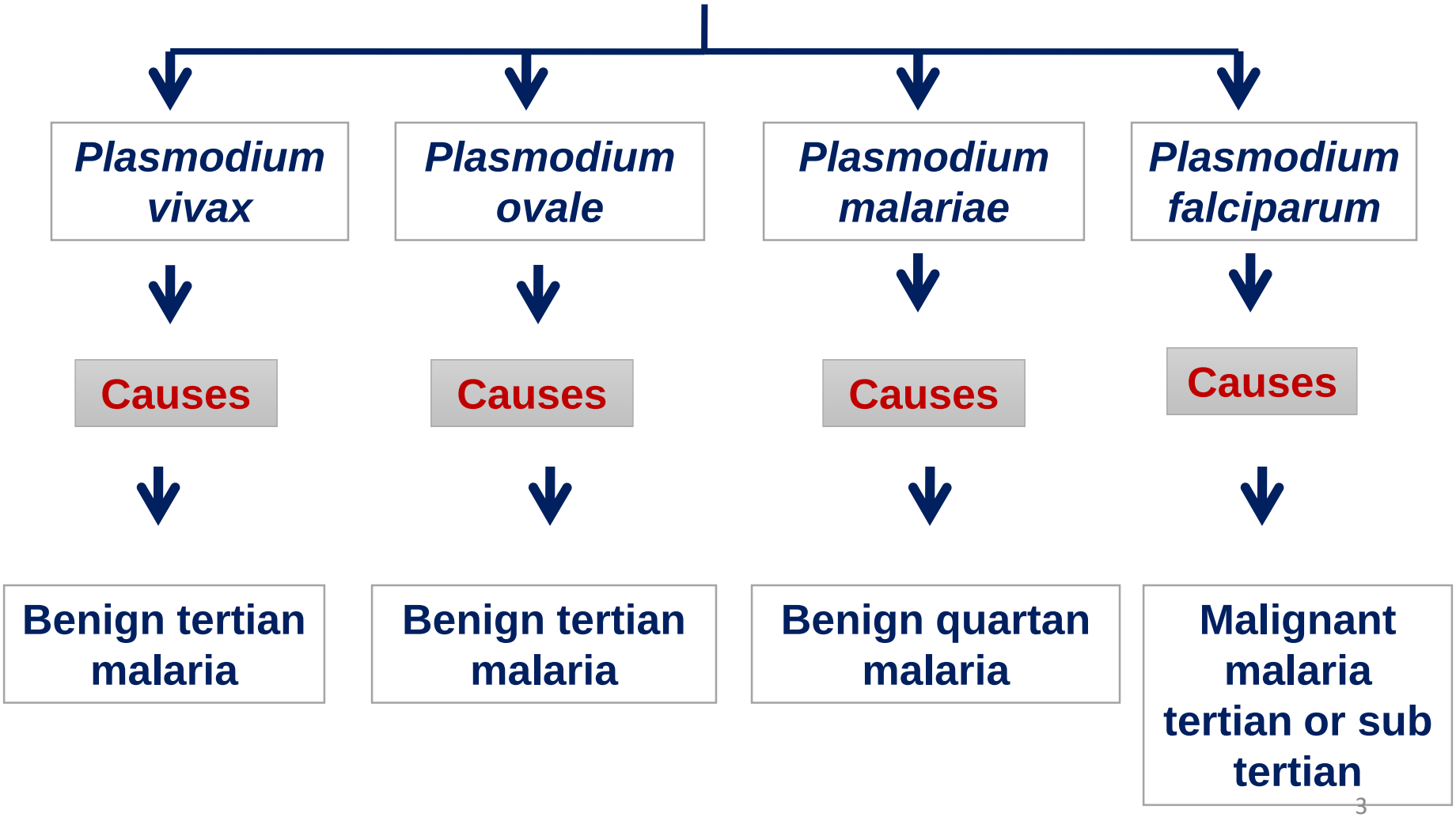
- **General characters:**

1- No special organs for locomotion (move by gliding) in some stages of their life cycle.

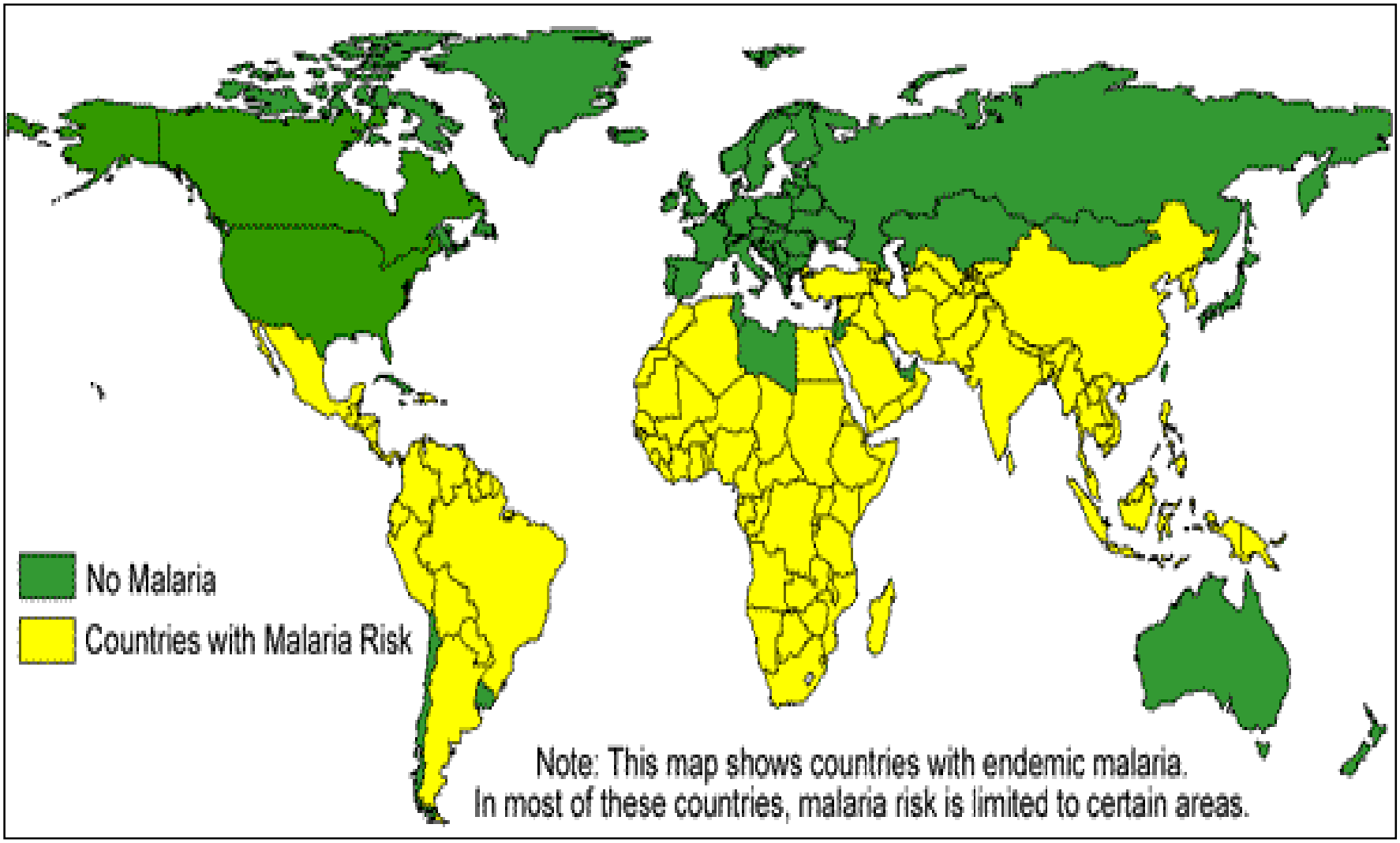
2- Multiply by alternation of sexual and asexual generations.

Plasmodia

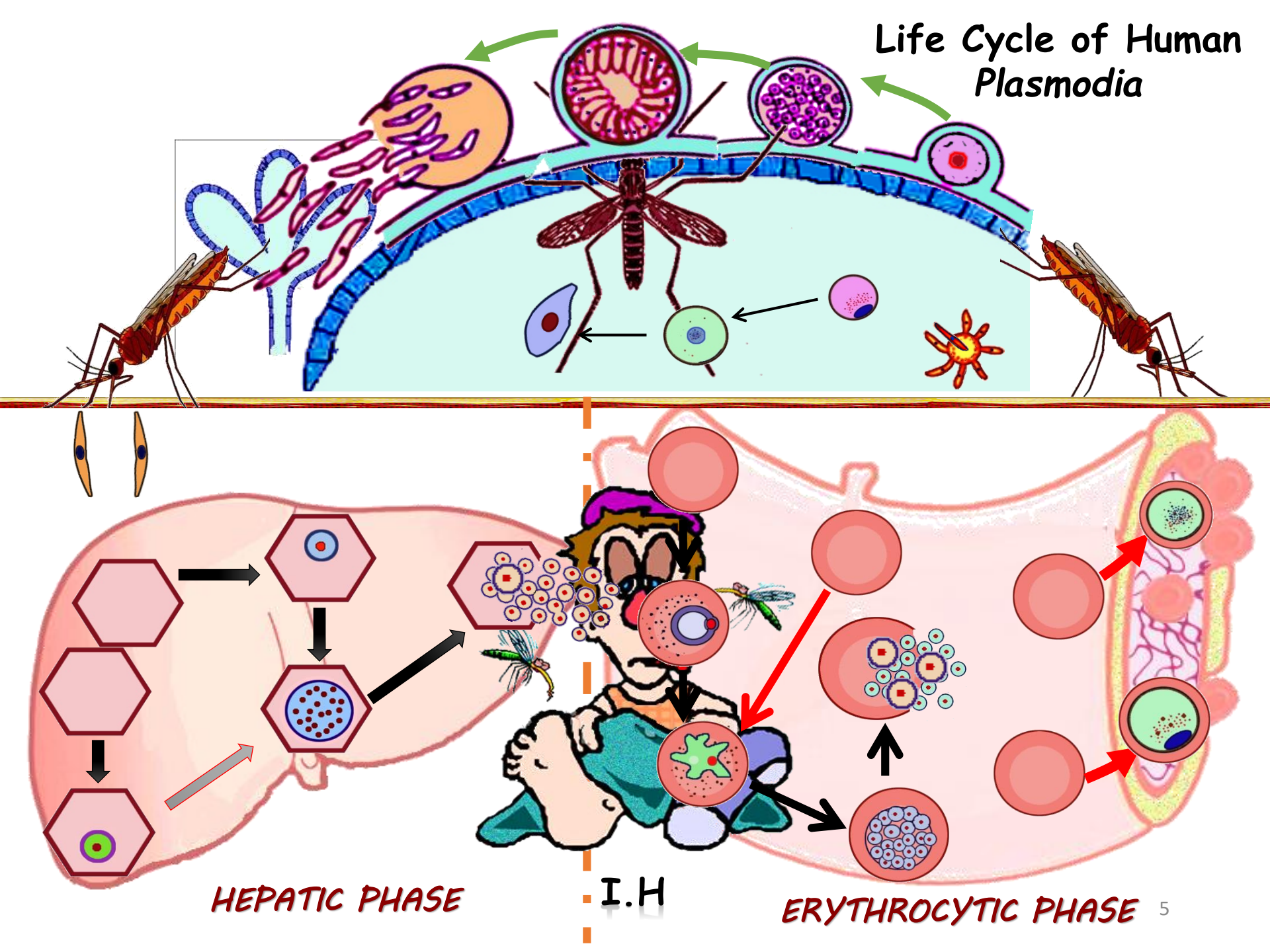
Malaria parasites



Malaria endemic areas



Life Cycle of Human *Plasmodia*



Life cycle

The life cycle of malaria passes in 2 alternate hosts

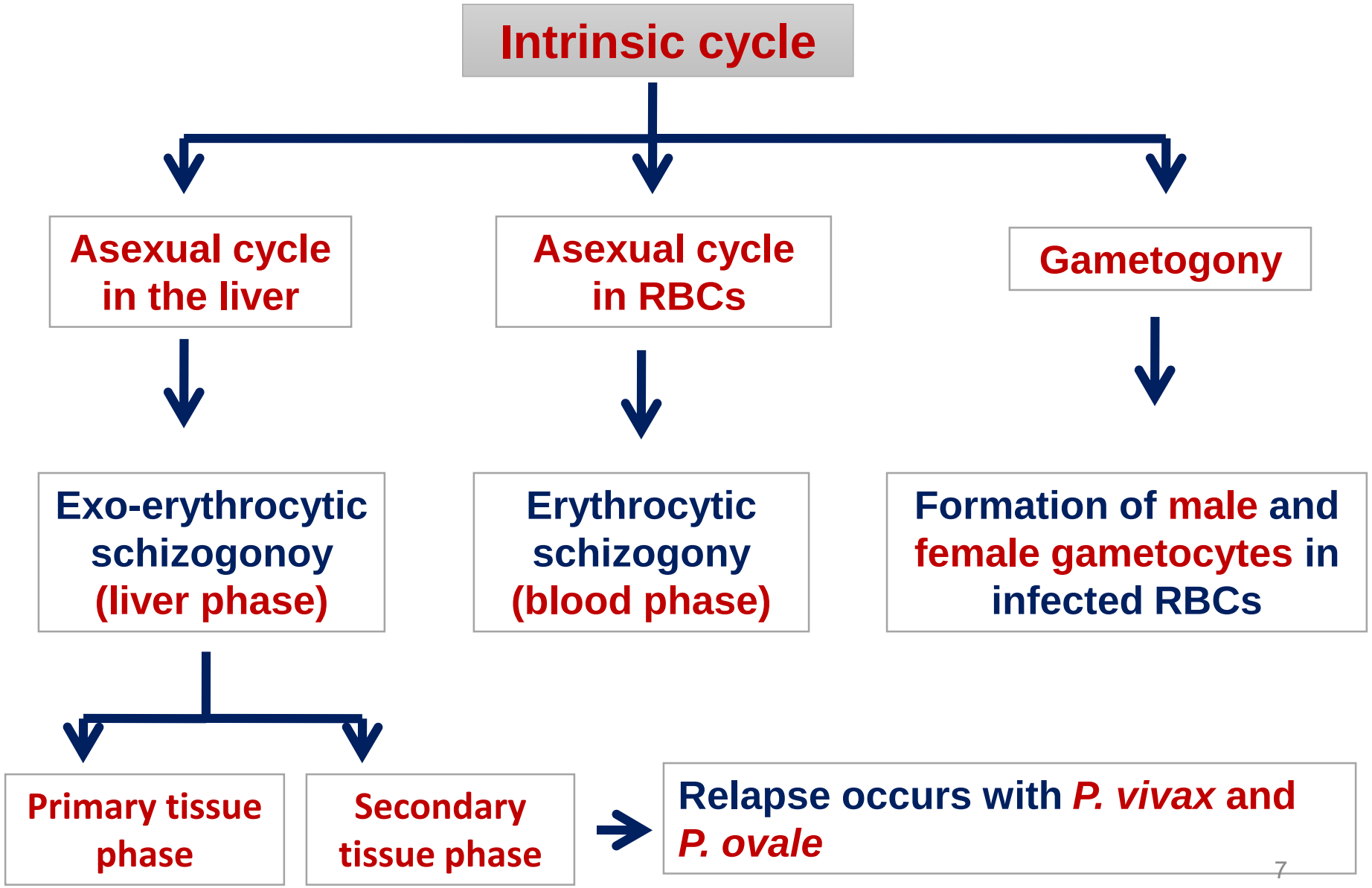
Man (I.H)

The asexual cycle (Schizogony) takes place ends by the formation of male and female gametocytes (Gametogony).

Female *Anopheles* (D.H)

The sexual cycle (Sporogony) takes place.

Life cycle of malaria parasites in man

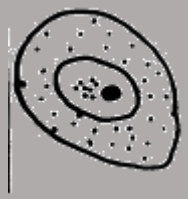
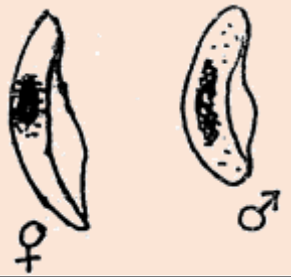


Life cycle of malaria parasites in mosquito

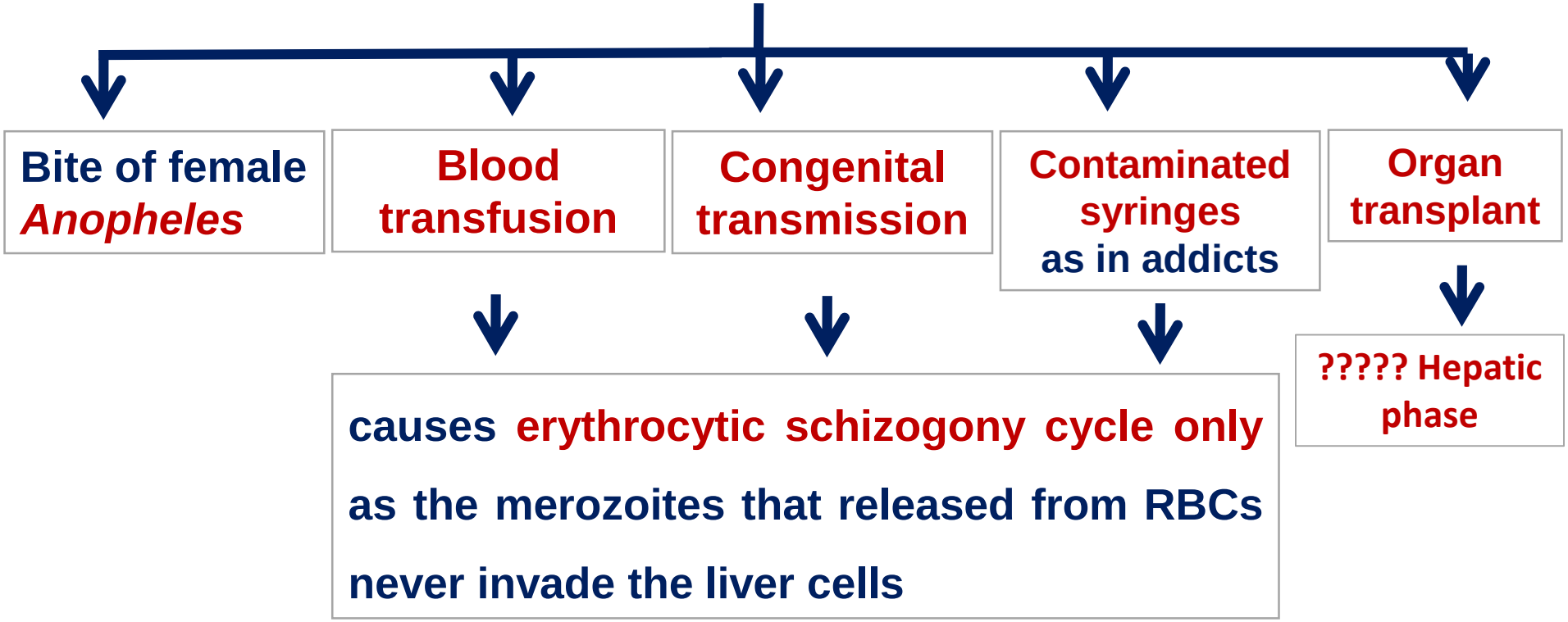
Extrinsic cycle or Sporogony

➢**Start when female *Anopheles* bites infected person for blood meal that containing all stages of malaria parasite. All the stages are digested in the stomach of the mosquito except the gametocytes (I.S to mosquito).**

➢**End by Fertilization between microgamete & the macrogamete forming a zygote ➲ elongated ookinete ➲ spherical oocyst ➲ sporocyst containing a large number of sickle- shaped sporozoites (I.S to man).**

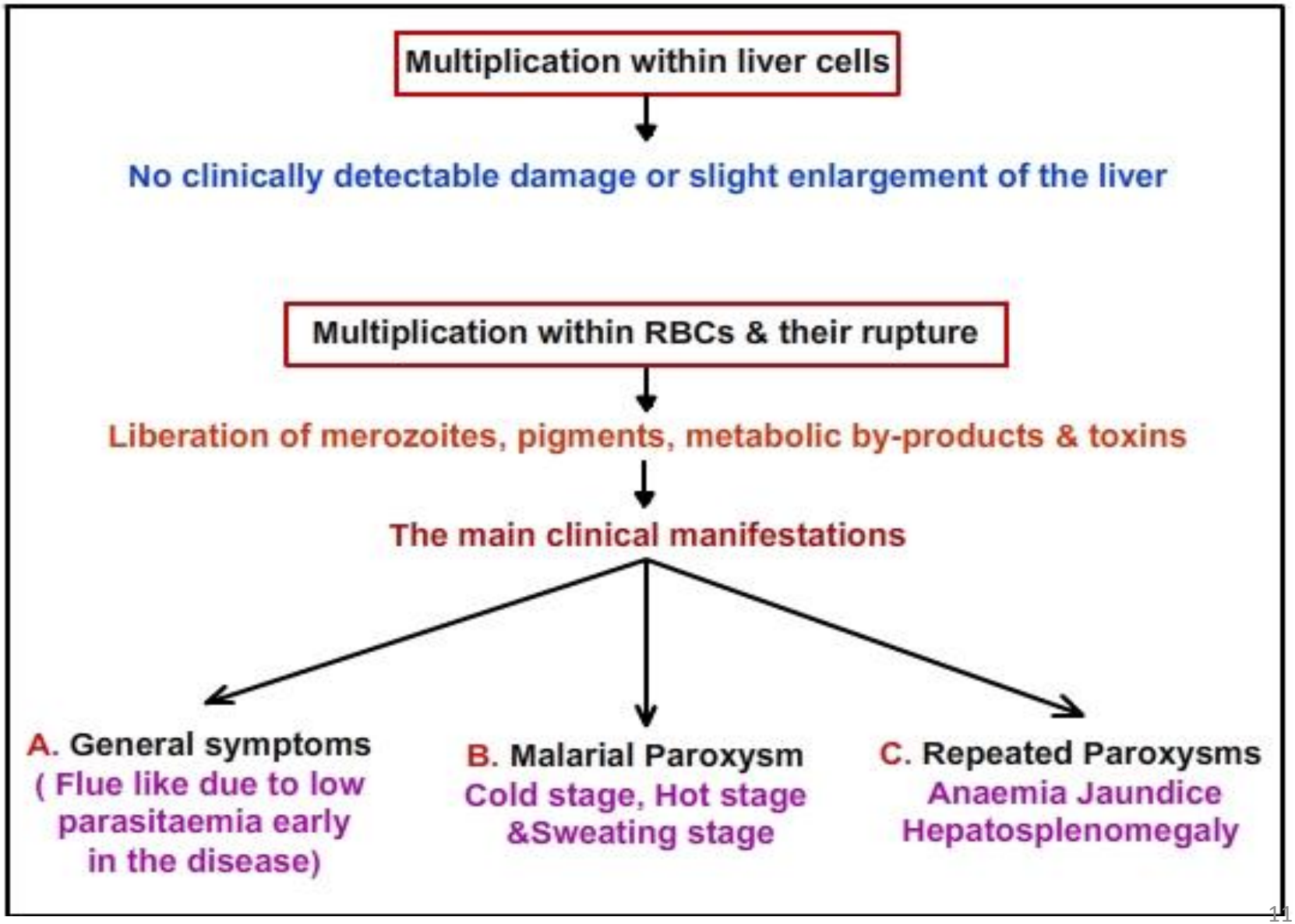
	Plasmodium vivax	*Plasmodium ovale*	*Plasmodium malariae*	*Plasmodium falciparum*
Trophozoite (ring stage)				
Mature trophozoite				
Schizont				
Gametocyte				
	Infect young RBCs		**Old RBCs**	**All RBCs ages**

Mode of transmission



Infective stages ??????????????????

Pathogenesis



Clinical pictures

1) General symptoms in all types of malaria

A- Prodromal symptoms (Low parasitemia and asynchronous RBCs rupture)

Low grade fever, malaise, headache and pain in bone and joints.

B- Malarial paroxysm

➢Due to synchronous rupture of a large number of parasitized RBCs and liberation of merozoites with malarial pigment and toxin into the circulation.

- **Cold stage (1/2- one hour):** Sensation of cold, shivering and the patient is feverish. The skin is pale and cyanotic.
- **Hot stage (1-4 hours):** High fever (40 C° or more), hot dry skin, flushed face, headache and pain in limbs and back .
- **Sweating stage (1-4 hours):** Profuse sweating with ↓ temperature, moist and coal skin).

C - Repeated paroxysms (Anemia, jaundice, hepatosplenomegaly)

✍**N.B.** **The patient becomes normal and temperature is normal till the second paroxysm occurs. Malaria paroxysms occur for at least 2 weeks or more with decreasing intensity then stop.**

The attacks recur at the following interval

In benign tertian malaria (*P. vivax&p. ovale*)	In benign quartan malaria (*P. malariae*)	In malignant malaria (*P. falciparum*)
↓	↓	↓
The attack is repeated every 3 days	The attack is repeated every 4 days	The attack is irregular

2) Specific symptoms

In *P. malariae*

Antigen antibody complex is deposited in the kidney glomeruli ➲ **nephrotic syndrome** with the occurrence of edema and protein and cast in urine.

In *P. falciparum*

➢ **Adhesion phenomena (pernicious syndrome)** occurs in infected RBCs containing **trophozoites and schizonts.** RBCs clump together and stick to the endothelium of the blood vessels ➲ **vascular obstruction of small blood vessels of internal organs** ➲ tissue anoxia of organs including brain, kidney, GIT, heart, lung, liver and adrenal

➢ **Black water fever**

Acute intravascular haemolysis of infected RBCs ➲severe anaemia, fever, jaundice, haemoglobinuria (dark red urine) and acute renal failure due to inadequate quinine treatment.

➢ **Cerebral malaria:** headache, high fever, convulsion, paralysis, coma and death.

➢ **Algid malaria :**shock, collapse , sudden ⬇ in blood pressure due to adrenal insufficiency

➢ **Gastrointestinal malaria:** diarrhoea or dysentery with bloody loose stool ➲ malabsorption and dehydration

➢ **Congenital malaria** ➲ abortion.

- **Why *Plasmodium falciparum* causes malignant malaria and is more dangerous ??????????**

- **Differences between malarial relapse and recrudescence ?????**

Laboratory Diagnosis

Direct

Microscopic: Thin and thick blood films stained with **Giemsa and Leishman** reveal different stages (rings, trophozoites, schizonts and gametocytes) in all types of malaria except in *P. falciparum* only rings and gametocytes are seen in the peripheral blood (due to adhesion phenomena).

Indirect

1-Serological tests: CFT, IHT, ELISA, FAT, or rapid strip or dip stick test to detect circulating antigens using monoclonal antibodies.

2-Molecular diagnosis: by PCR.

Treatment

- **Tissue schizonticide and hypnozoiticides**
  - ➢ Primaquine
    - It is also gametocidal
- **Blood schizonticides**
  - **Chloroquine-sensitive**
    - ➢ Chloroquine
  - **Chloroquine-resistant**
    - **Fansidar:** Pyrimethamine &sulphadoxine
    - **Artemisinin-based:** Pyrimethamine/ sulphadoxine + artesunate
    - **Mefloquine:**
- **Treatment of complications**
  - ➢ Blood transfusion in severe anaemia.
  - ➢ Haemodialysis in renal failure.
- **Chemoprophylaxis**
  - ➢ Weekly mefloquine
  - ➢ Daily doxycycline
    - When and How long?????

Malaria- Prevention

Key methods to prevent malaria transmission are:

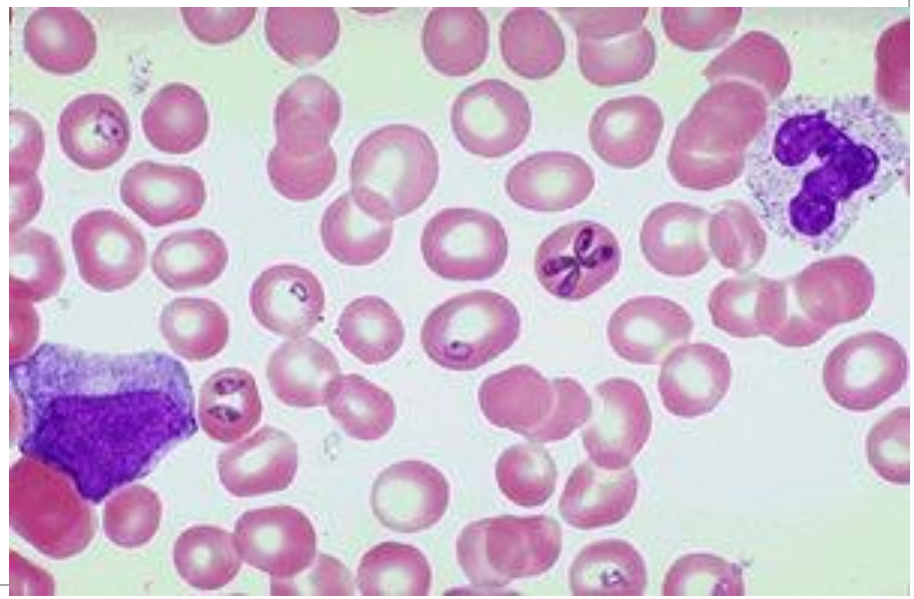
- Long lasting insecticide impregnated nets (LLINs)
- Indoor residual spraying
- Mosquito repellents
- Preventative drug treatments

Babesia

- ***Babesia*** **species cause a disease known as babesiosis.**
- **Causative organisms:**
  - ***Babesia microti***
  - ***Babesia divergens*** **(commonly affects splenectomized-persons)**
- **Habitat: RBCs.**
- **D.H and vector of transmission: Hard tick**
- **I.H: Cattle and rodents and occasionally man.**

Differences between *Babesia* and *Plasmodium*

- **No hepatic stage.**
- **Merozoites arranged in pairs or Maltese cross**
- **No pigments**
- **Vector is the hard tick**



Mode of transmission:

1- Bite of hard tick (sporozoites)

2- Blood transmission (erythrocytic stages)

Pathogenesis & symptomatology

❖**Disease : Babesiosis.**

The parasite invades the RBCs where it multiplies by budding ➲ the cell ruptures and the released parasites invade other cells leading to anaemia, jaundice, and hepatosplenomegaly.

Laboratory diagnosis

Direct

- **Stained blood film by Giemsa or Leishman to detect the intraerythrocytic paraites.**
- **Animal inoculation : blood sample is injected intraperitoneally in hamester, the parasites can be detected in animal blood after 2 weeks in positive cases.**

Indirect

- **Serological tests**
- **PCR to detect *Babesia* DNA**

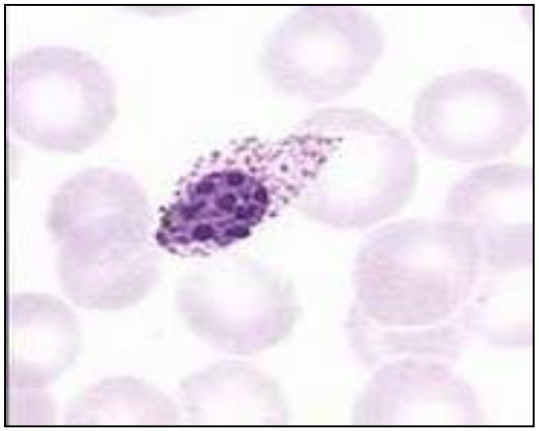
Treatment

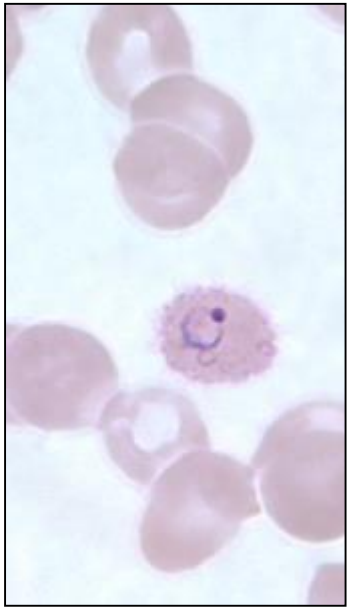
1. Quinine + clindamycin.

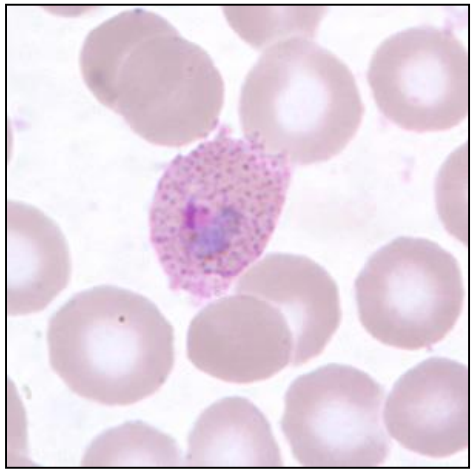
2. Exchange blood transfusion in severe cases

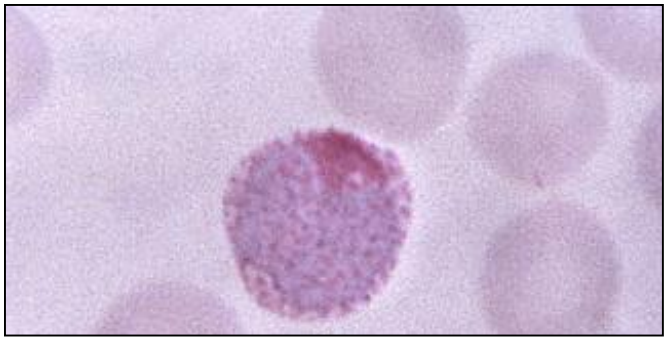

?
Quiz
Time

Guess the stage?









Guess what is this?