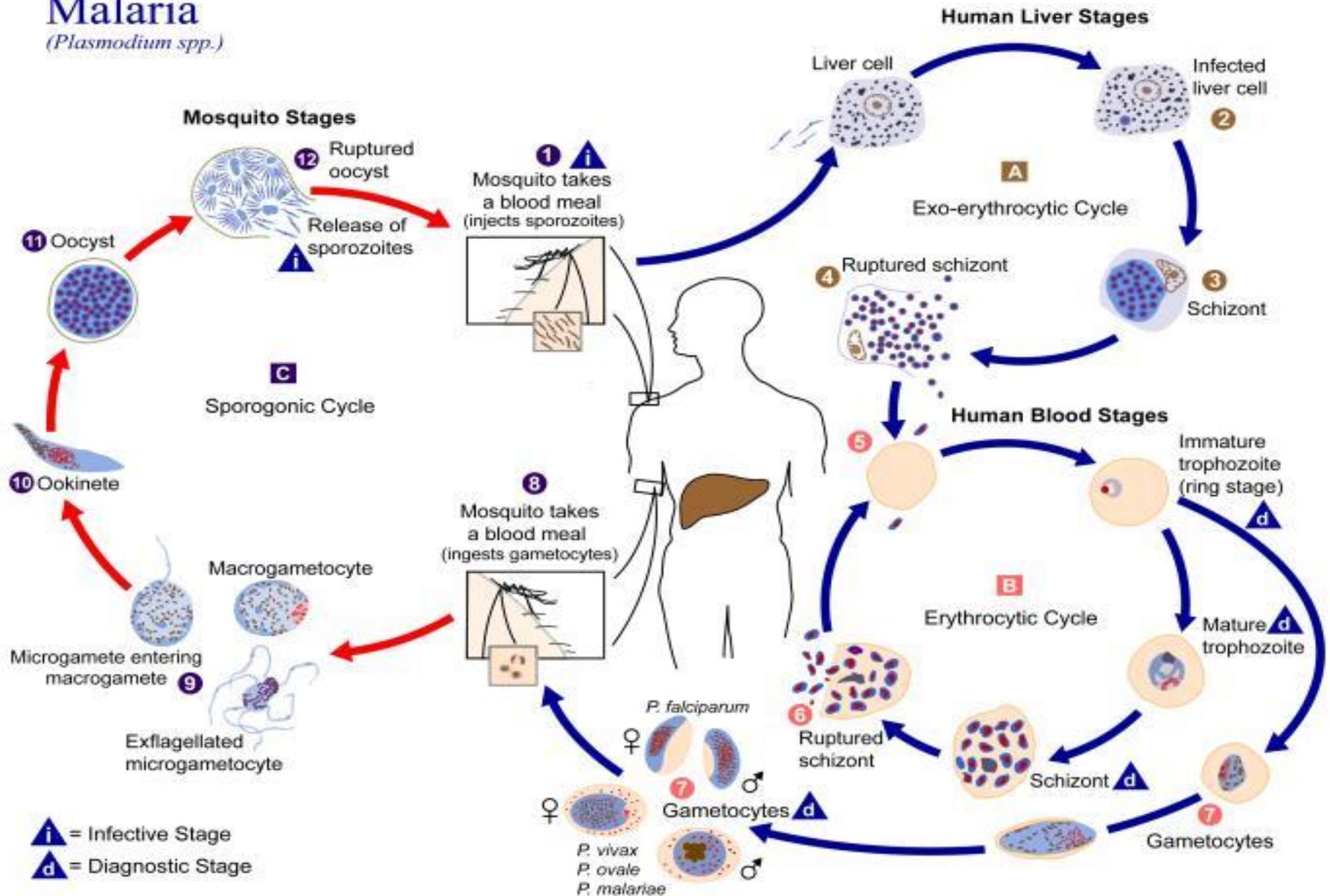


# Life Cycle

## Malaria

(*Plasmodium spp.*)



- **Trophozoites:**  
Growing form in human blood (ring form and all stages onwards except fully grown gametocytes and Schizonts)
- **Schizont:** Asexually dividing form i) Immature schizont ii) Mature schizont
- **Schizogony:** Asexual reproduction → N/C divides → Merozoites in RBC and liver
- **Sporogony:** Sexual reproduction forming sporozoites (mosquitoes)
- **Sporozoite:**  
the morphological form which develops in the mosquito salivary gland and is injected when the mosquito feeds, infecting humans.
- **Gametocyte:** From some trophozoites or merozoites in RBCs ???  
It is infective to mosquito
- **Gametes:** From micro and macro-gametocytes  
Macro-gamete/female (nuclear reduction 1:1)  
Micro-gamete/male (exflagellation 1:4-8)
- **Zygote:** Fertilized macro-gamete
- **Ookinete:** A motile zygote
- **Oocyst (Spore):**  
Rounded, immotile ookinete, membranous cyst wall, containing many sporozoites

## MORPHOLOGY

### Peripheral blood stained with Leishman's stain

#### 1. Small Trophozoites (Ring forms):

Infected RBC → at first ring form

- a) Dot/rod shaped nucleus (red)
  - b) Peripheral rim of cytoplasm (blue)
  - c) Central clear vacuole like area (not stained)
- Different species have different rings

#### 2. Large Trophozoite:

- Ring form → Large trophozoite
- Fine grains of pigment Hematin

#### 3. Schizont:

Large trophozoite → schizont → N/C fragments  
→ merozoites

#### 4. Gametocytes:

- Male and female distinguishable
- Fully grown → rounded → occupies most of RBC
- *P. falciparum* → sausage shaped → crescent in RBC

## MORPHOLOGY

FEATURE	P.VIVAX	P.MALARIAE	P.FALCIPARUM	P.OVALE
Infected RBCs	Enlarged,pale,fine stippling(schuffner's dots)primarily invade reticulocytes,young RBCs	Not enlarged,no stippling,primarily invades older RBCs,Ziemann's dots on prolonged staining	Not enlarged,coarse stippling-Maurer's clefts,invades all RBCs	Enlarged,oval,fimbriated RBCs,pale,conspicuous James dots
Ring stage trophozoites	Large rings (1/3–1/2 red cell diameter). Usually one chromatin granule; ring delicate.	Large rings (1/3 red cell diameter). Usually one chromatin granule; ring thick.	Small rings (1/5 red cell diameter). Often two granules; multiple infections common; ring delicate, may adhere to red cells.	Large rings (1/3 red cell diameter). Usually one chromatin granule; ring thick.
Pigment in developing trophozoites	Fine; light brown; scattered.	Coarse; dark brown; scattered clumps; abundant.	Coarse; black; few clumps.	Coarse; dark yellow-brown; scattered.
Older trophozoites	Very pleomorphic.	Occasional band forms.	Compact and rounded.	Compact and rounded.
Mature schizonts (segmenters)	More than 12 merozoites (14–24).	Fewer than 12 large merozoites (6–12). Often in rosette.	Usually more than 12 merozoites (8–32). Very rare in peripheral blood.	Fewer than 12 large merozoites (6–12). Often in rosette.
Gametocytes	Round or oval.	Round or oval.	Crescentic.	Round or oval.

# *Cycles differs in Different species*

Cycle repeats every 48 hours in

1 *P.falciparum*

2 *P.ovale*

3 *P.vivax*

4 Repeats every 72 hours In

*P.malaria*

## *Incubation period varies according to species*

- Which includes Exo erythrocytic cycle time and one or two erythrocytic cycles,
- *P.vivax* and *P.falciparum* 10 – 15 days (can vary from weeks to months)
- *P.malariae* infection can start after 28 days.
- *Clinical Manifestations are related to cycle of events in relation to RBC*

# *How Malaria present Clinically*

- **Stage 1**
  - Chills for 15 min. to 1 hour
  - Caused due to rupture from the host red cells escape into Blood
  - Preset with nausea, vomitting, headache
  - **Stage 2**
  - Fever may reach upto 40<sup>0</sup>c may last for several hours starts invading newer red cells.
  - **Stage 3**
- Patent starts sweating, concludes the episode
- Cycles are frequently Asynchronous
- Paroxysms occur every 48 – 72 hours
- In P.malariae pyrexia may lost for 8 hours or more and temperature my exceed 41<sup>0</sup>c

More commonly, the patient presents with a combination of the following symptoms

- Fever
- Chills
- Sweats
- Headaches
- Nausea and vomiting
- Body aches (back and joint pain)
- General malaise.
- Gastrointestinal symptoms

# Early symptoms

- **The common first symptoms – fever, headache, chills and vomiting – usually appear 10 to 15 days after a person is infected. If not treated promptly with effective medicines, malaria can cause severe illness and is often fatal.**

## *What are the characteristics of a malaria attack*

- Fever and shivering. The attack begins with fever, with the temperature rising as high as 40°C and falling again over a period of several hours.
- A poor general condition, feeling unwell and having headaches like influenza.
- Diarrhea, nausea and vomiting often occur as well.