

LECTURE: Malaria

Editing File

- Important
- Doctor's notes
- Extra explanation
- Only F or only M

"لا حول ولا قوة إلا بالله العلي العظيم" وتقال هذه الجملة إذا
داهم الإنسان أمر عظيم لا يستطيعه ، أو يصعب عليه القيام به .

OBJECTIVES:

- Know the 5 species of malaria that infect humans
 - Describe the life cycle of malaria, morphology and clinical picture
 - Compare pathogenesis of different malaria species
 - Know endemic countries of malaria species
 - Know malaria paroxysm
 - Know complications of malaria
 - Describe methods for laboratory diagnosis of malaria
 - Know action of anti malarial drugs in different life stages of malaria parasite
-

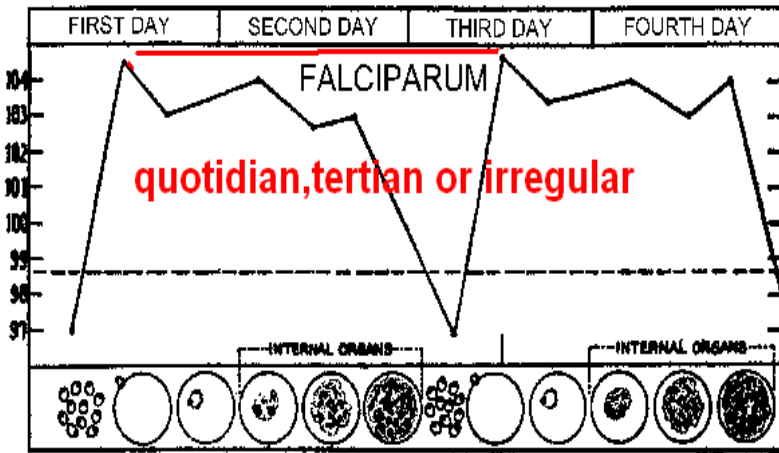
Malaria:

- Malaria is the most important of all tropical parasitic disease ,causes death and debility and is endemic throughout the tropics and subtropics.
- The main symptoms and signs are periodic fever **حرارة بوقت** وطريقه معينه, headache ,anorexia and anemia.
- *Uncomplicated malaria is defined as:*
Symptomatic infection with malaria parasitemia without signs of severity and/or evidence of vital organ dysfunction.

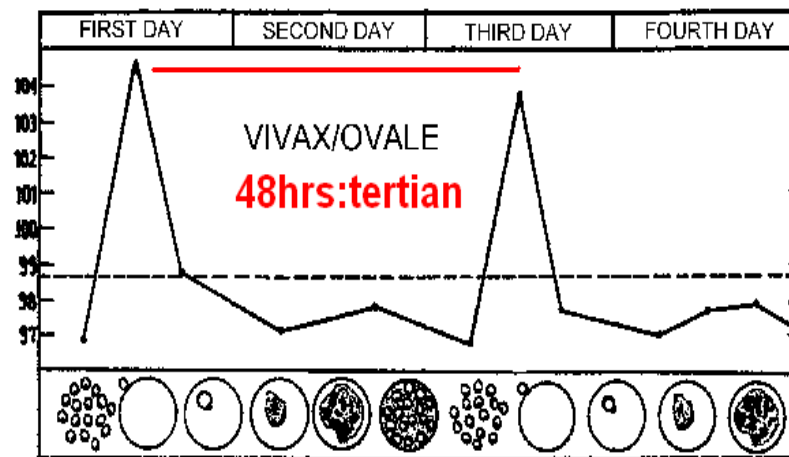
Five species of malaria infect humans:

- **Plasmodium falciparum IMP**
- Plasmodium **vivax**
- Plasmodium **ovale**
- Plasmodium **malariae** **Quartan**
- Plasmodium **knowlesi**

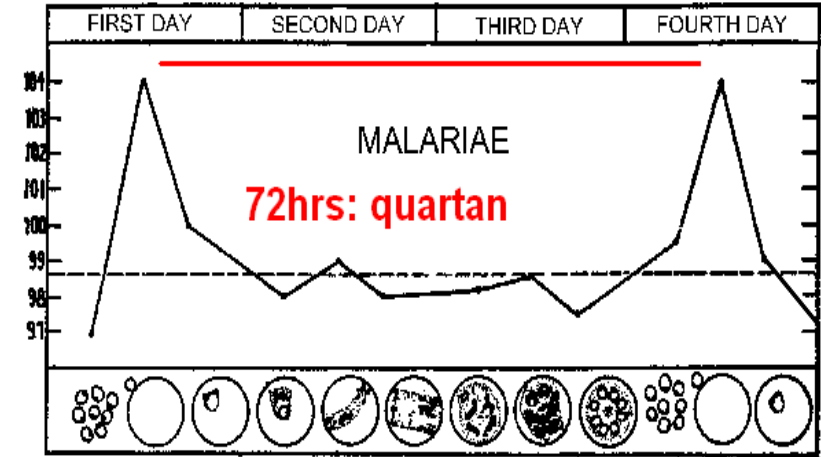
Plasmodium falciparum:irregular



Plasmodium vivax, Plasmodium ovale
48h



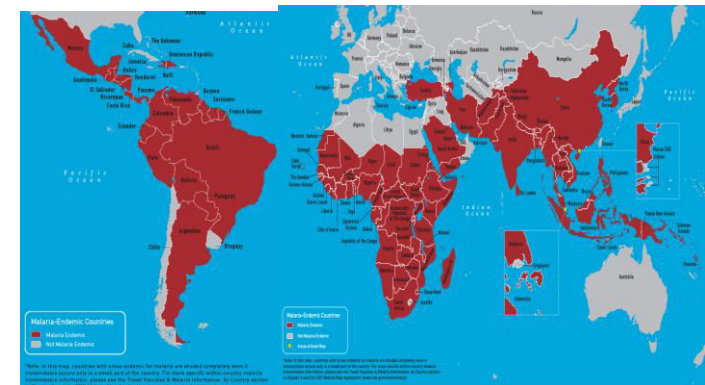
Plasmodium malariae:72h



Epidemiology: IMP

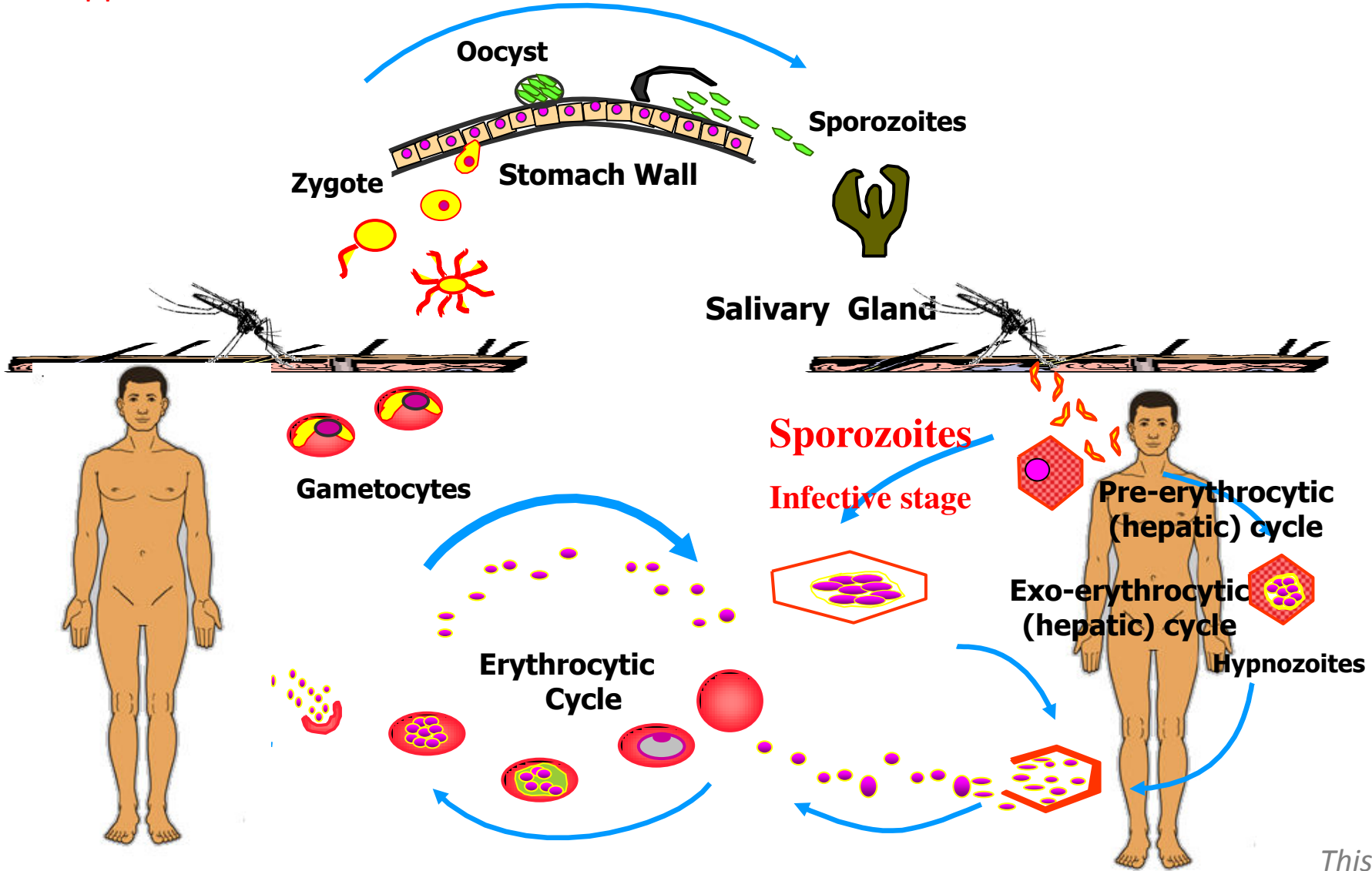
Asexual stage:	<ul style="list-style-type: none">• Anopheles Mosquito inject sporozoite to human → enter the liver → the liver release merozoite → enter the RBC (ring stage) and cause the main pathology which is blood hemolysis and anemia• Mosquito inject sporozoite to human (infective stage)• Mosquito suck gametocytes from human• Some parasite develop into male + female gametocyte .
Sexual stage:	male and female Gametocyte are taken up from the blood of an infected human by biting mosquito .Further sexual development takes place in the mosquito gut to produce SPOROZOITES.
Transmission:	<ul style="list-style-type: none">• Human to human transmission can occur by blood transfusion• vertical transmission across the placenta. mainly from mosquito to human

Endemic Countries



The mosquito give sporozoites and take the gametocytes and happen inside it the sexual stage

Life Cycle of Malaria



This slide is animated

Components of the Malaria Life Cycles

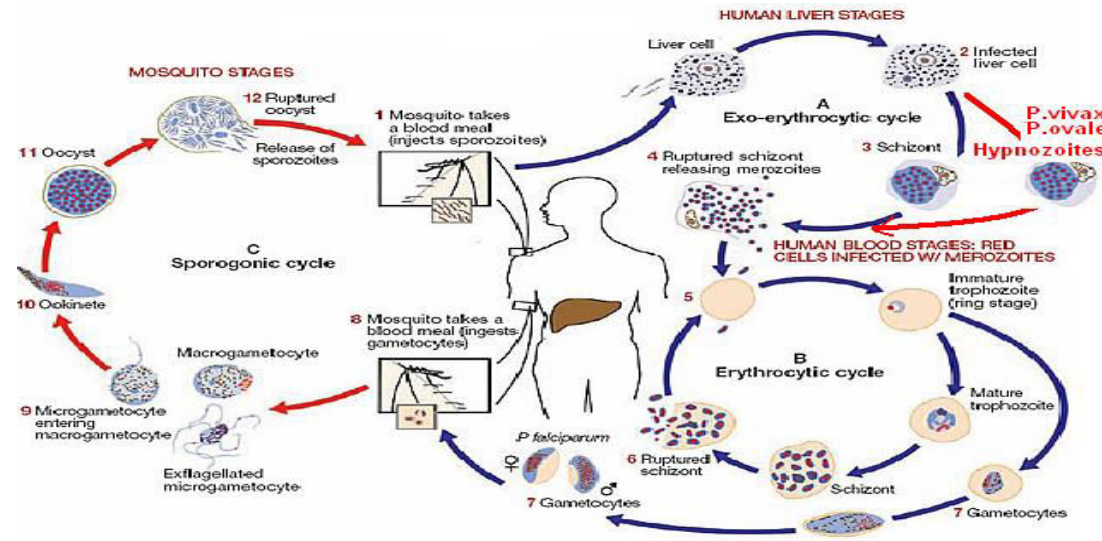
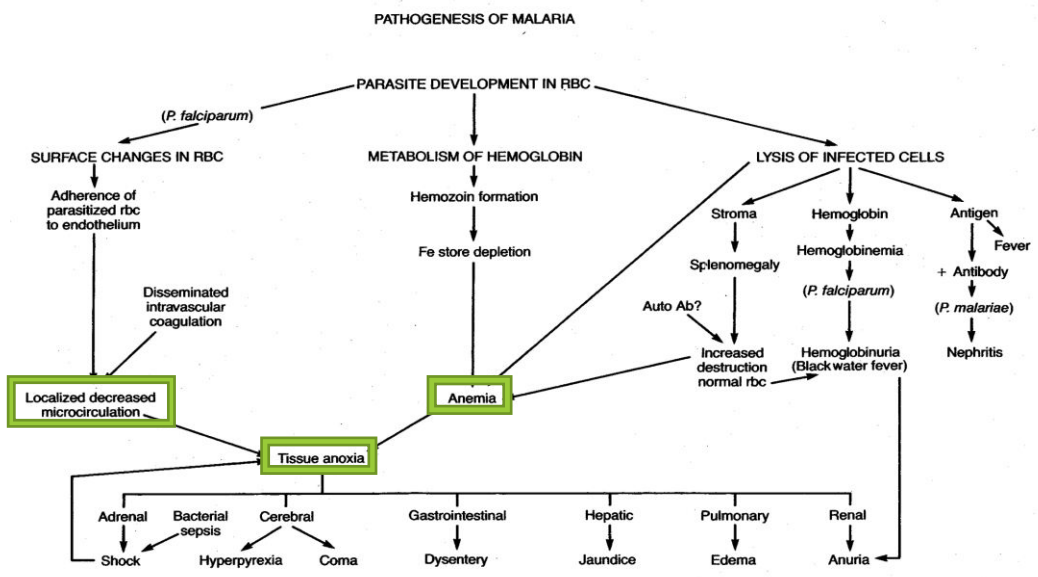
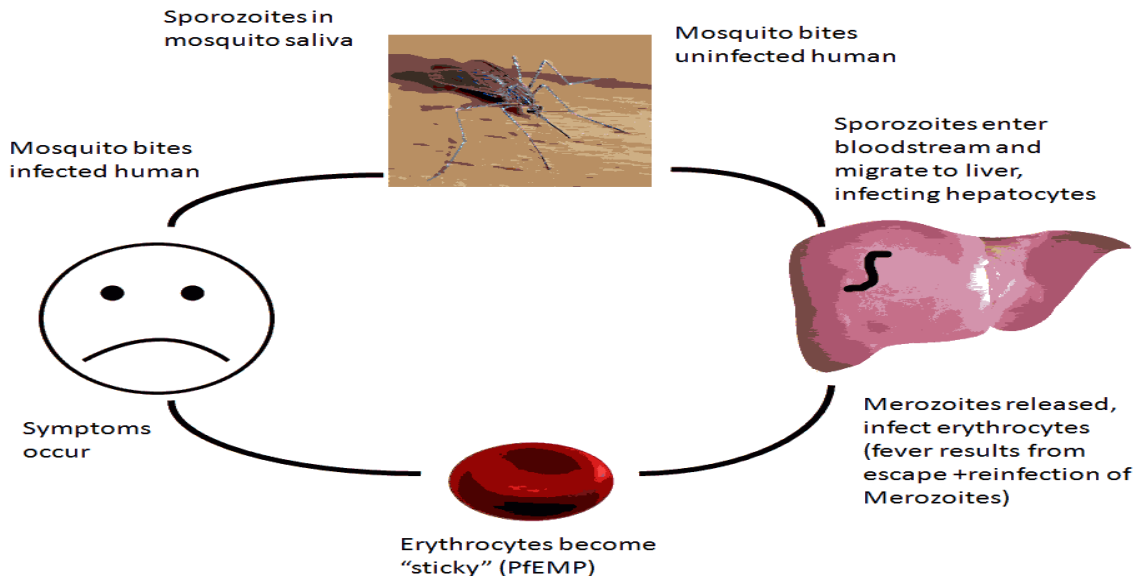
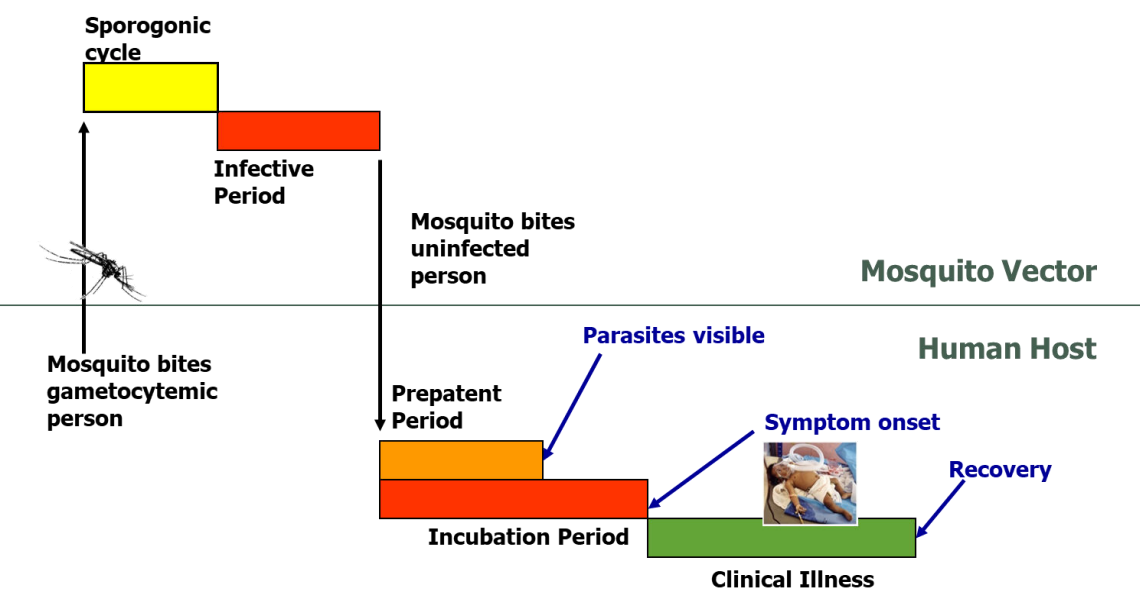
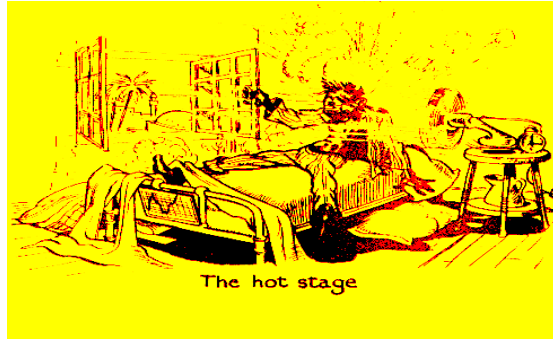


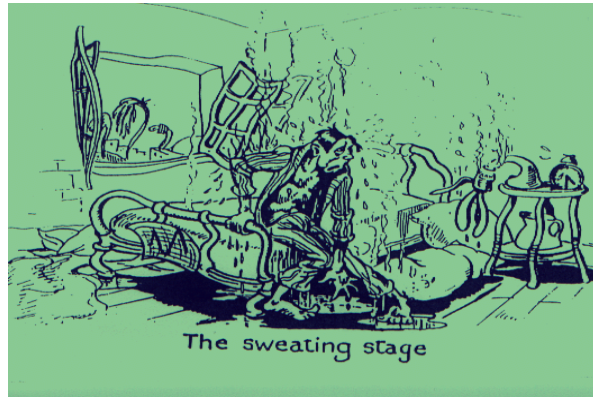
Figure 1—Malaria parasite life cycle. A malaria-infected female Anopheles mosquito inoculates sporozoites into the human host. Sporozoites infect liver cells and mature into schizonts, which rupture and release merozoites that infect red blood cells. Ring-stage trophozoites mature into schizonts, which rupture, releasing merozoites. Some parasites differentiate into sexual erythrocytic stages (gametocytes). Parasites in the blood are responsible for the clinical manifestations of the disease. Adapted from the CDC.

Clinical signs and symptoms of Malaria: Malarial Paroxysm



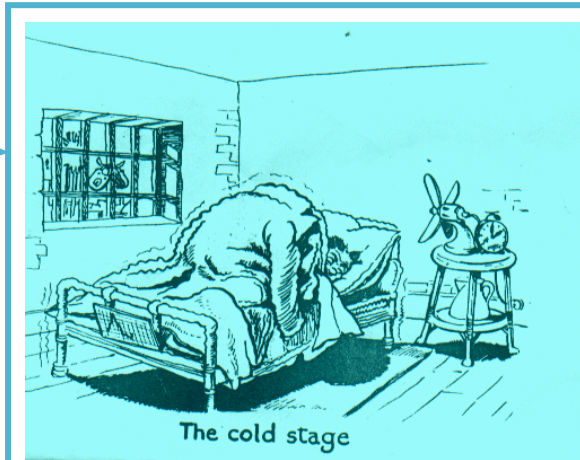
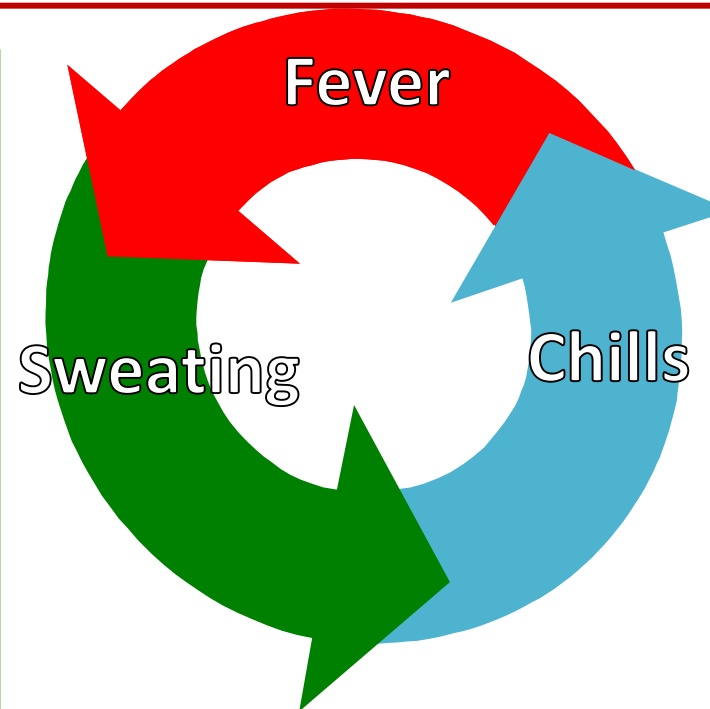
hot stage

- intense heat
- dry burning skin
- throbbing headache
- lasts 2-6 hours



sweating stage

- profuse sweating
- declining temperature
- exhausted and weak → sleep
- lasts 2-4 hours



cold stage

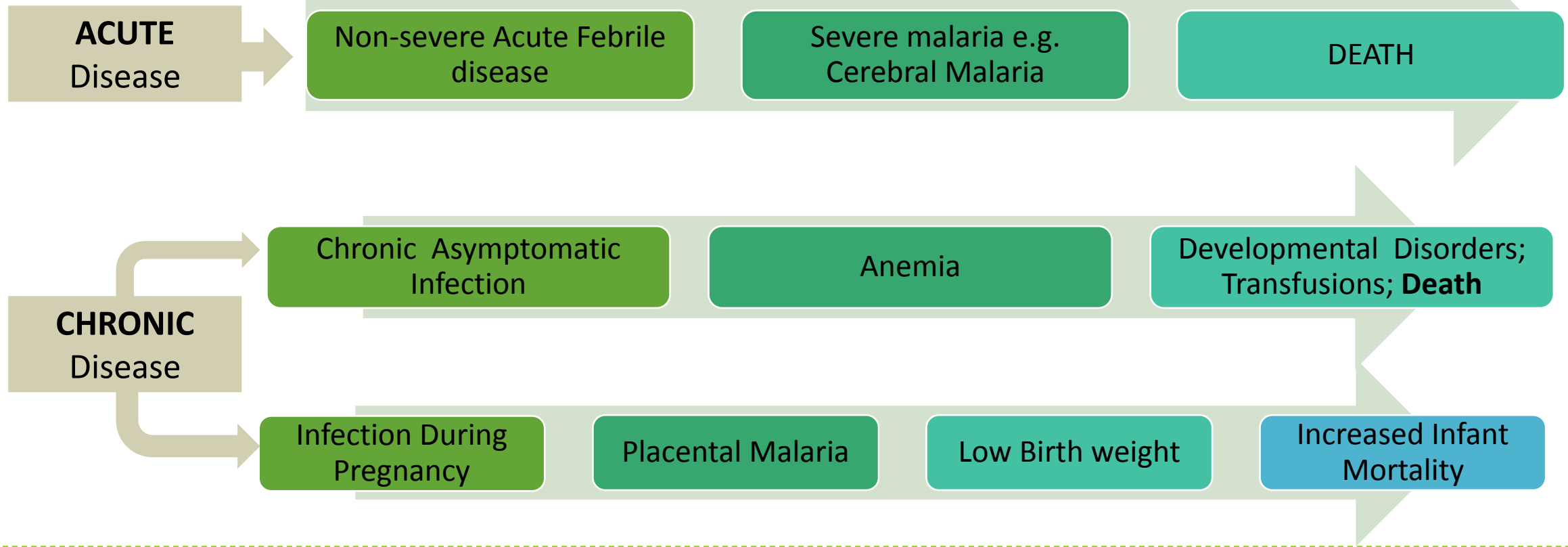
- feeling of intense cold
- vigorous shivering
- lasts 15-60 minutes

Pathogenesis of MALARIA:




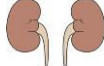





- Symptoms are due to: **the main pathology of malaria is the infection of the RBCs (hemolysis of RBCs)**
 - Hemolysis of Red Blood Cells : with release of metabolites and pigments from Malaria parasite.
 - Plugging of capillaries by parasitized erythrocytes :In cerebral malaria there is sequestration of parasites in central nervous system capillaries. **The most one that do that is PLASMODIUM FALCIPARUM**

Clinical Picture

Plasmodium falciparum can cause death



Malaria: Definition

- Severe malaria is defined as symptomatic malaria in a patient with *P. falciparum* with one or more of the following complications:
 1. Cerebral malaria (unrousable coma not attributable to other causes).
 2. Generalized convulsions (> 2 episodes within 24 hours) 
 3. Severe normocytic anemia (Ht<15% or Hb < 5 g/dl) 
 4. Hypoglycaemia (blood glucose < 2.2 mmol/l or 40 mg/dl) and pulmonary edema in pregnancy can lead to abortion ,stillbirth seen in tropical Africa.
 5. Metabolic acidosis with respiratory distress (arterial pH < 7.35 or bicarbonate < 15 mmol/l)
 6. Fluid and electrolyte disturbances 
 7. Acute renal failure (blackwater fever) (urine <400 ml/24 h in adults; 12 ml/kg/24 h in children) 
 8. Acute pulmonary edema and adult respiratory distress syndrome 
 9. Abnormal bleeding 
 10. Jaundice 
 11. Haemoglobinuria
 12. Circulatory collapse, shock, septicaemia (algid malaria) 
 13. Hyperparasitaemia (>10% in non-immune; >20% in semi-immune) 
 14. Tropical splenomegaly.
-

Malaria: sever Complications P. falciparum

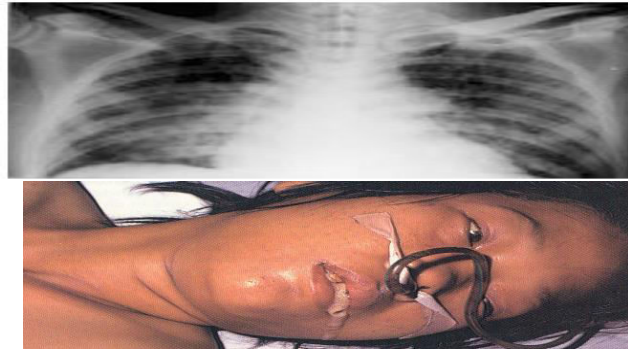
Bc the pregnant women are immunocompromised patient

Cerebral malaria



Cav cause coma and death

Hypo glycaemia and pulmonary edema in pregnancy



Malarial haemoglobinuria



Clinical Picture :

Haemoglobinuria associated with malaria **Acute renal failure** ("blackwater fever") is uncommon and malarial haemoglobinuria usually presents in adults as severe disease with anemia and renal failure.

Anaemia



Child with severe malaria anaemia and no other malaria complication



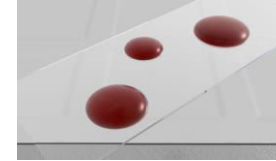
Child with severe malaria anaemia in conjunction with acidosis and respiratory distress

Acute renal failure (blackwater fever) can happened due to P. FALCIPARUM

Malaria: Diagnosis

Common methods for parasitological diagnosis of malaria

The two methods common in use :

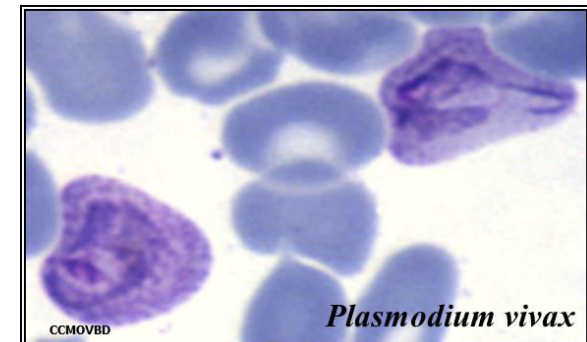
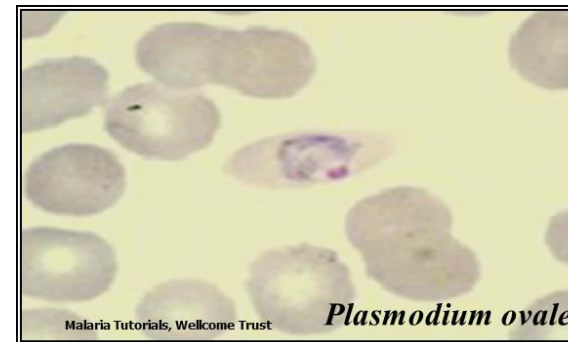
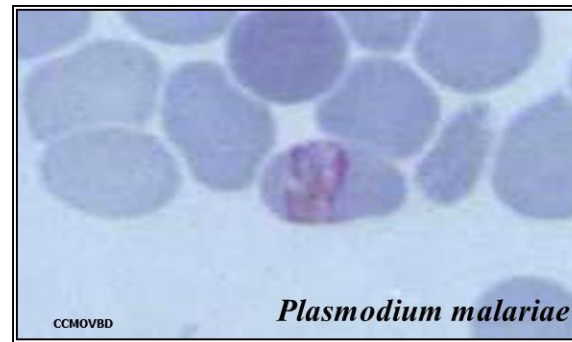
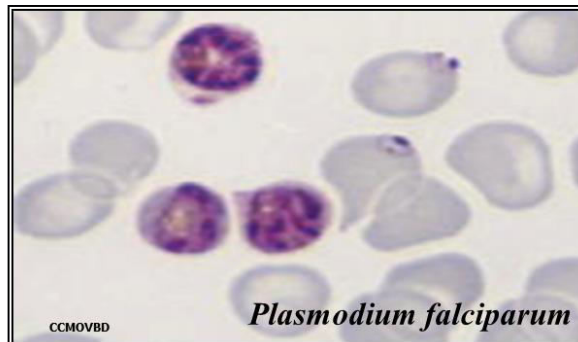


1: Light microscopy **the gold standard**

Microscopy is the gold standard for diagnosis of malaria

- Parasite density
- Species diagnosis
- Monitoring response to treatment

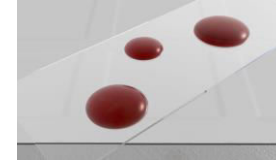
2: Rapid diagnostic tests (RDTs).



Malaria: Diagnosis

Common methods for parasitological diagnosis of malaria

The two methods common in use :

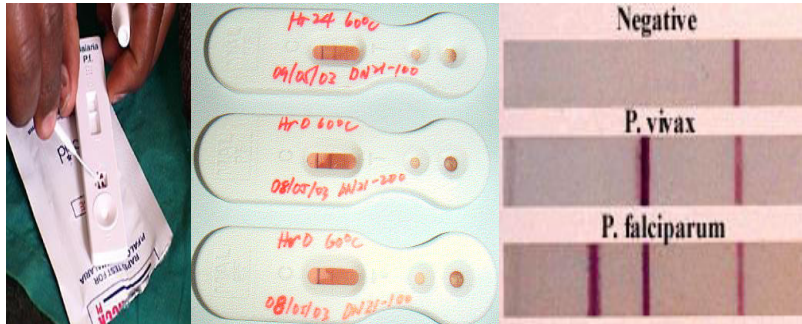


1: Light microscopy

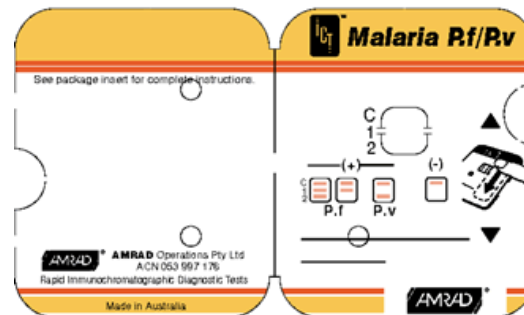
2: Rapid diagnostic tests (RDTs).

- Rapid diagnostic tests detect **malaria antigens**.
- The product comes in a number of formats:

Plastic cassette



Card



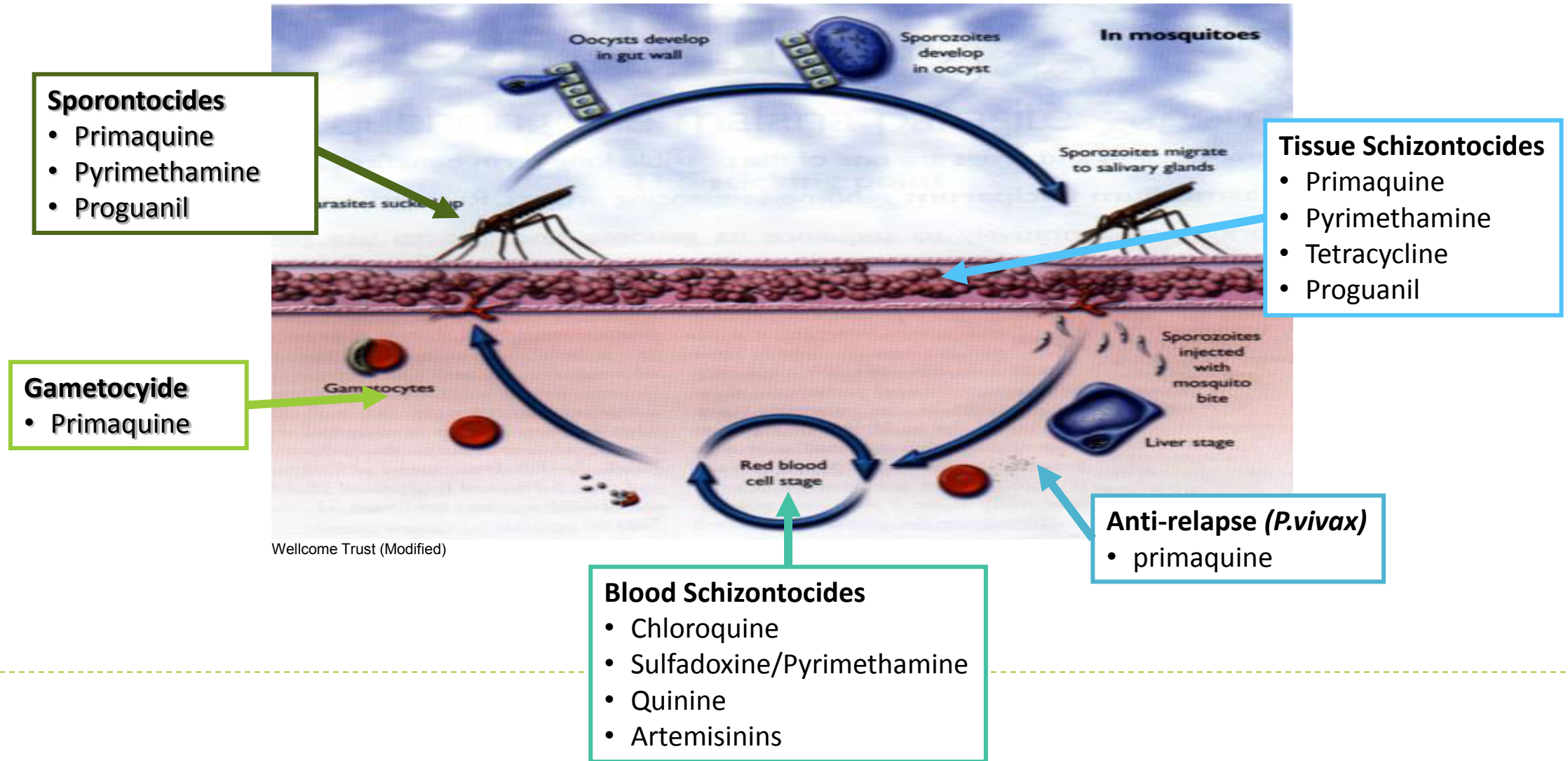
Dipstick



Hybrid cassette-dipsticks

Malaria: Treatment

Action of antimalarial drug in the different life stages of the malaria parasite



SUMMARY:

MALARIA

the most important of all tropical parasitic disease

Species of malaria	Plasmodium falciparum > Irregular	Plasmodium vivax. >48 h.
	Plasmodium malariae. > 72 h. (quartan)	Plasmodium ovale. >. 48 h.
The main symptoms	1-periodic fever 2-headache 3-anorexia 4-anemia.	
Transmission	Asexual stage	sporozoites > injected by > Mosquito > enter liver cells and will become Merozoites "ring stage" > penetrate the RBC and cause the main pathology of the disease <u>hemolysis and anemia</u>
	Sexual stage	male and female Gametocyte > taken up <u>from</u> human <u>by</u> mosquito > sexual development in mosquito gut > produce SPOROZOITES.
	Others	-Human to human > blood transfusion -vertical transmission > placenta
Pathogenesis أسباب الأعراض	- Hemolysis of Red Blood Cells -Plugging of capillaries (cerebral malaria)	
Clinical picture	-cold stage : Chills - hot stage: Fever - sweating stage: Sweating	
Complication	- in a patient with P. falciparum	1-Cerebral malaria مهم 2-Hypoglycaemia and pulmonary edema in pregnancy 3-renal failure , Hemoglobinuria ("blackwater fever") 4-respiratory distress 5-anaemia مهم 6- splenomegaly.
diagnosis	1-microscopy "gold standard" 1/Parasite density 2/Species diagnosis 3/Monitoring response to treatment 2-Rapid diagnostic tests	

QUIZ:

1. Which of the following species of malaria cause a regular periodic fever?

- a) *P. Falciparum* b) *P. malariae* c) *P. vivax*

2. Sporozoites when injected into the human skin it migrates to:

- a) Hepatocytes b) Lymphocytes c) Intestinal wall

3. What is the main cause of Anemia in malaria ?

- a) Sporozoites b) Trophozoites c) Merozoites

4. The sexual stage of *p. vivax* happens in:

- a) Mosquito b) Human c) cattle

5. Chronic Asymptomatic malaria lead to:

- a) Cerebral malaria b) placental malaria c) Anemia

6. The symptoms of malaria appear due to:

- a) Migration of sporozoites to hepatocytes b) hemolysis of RBCs c) entry of sporozoites into the skin

7. Cerebral anemia is caused by:

- a) *P. Falciparum* b) *P. malariae* c) *P. vivax*

8. Which of the following diagnostic methods used for detection of malarial antigens?

- a) Light microscopy b) RDTs c) Both

1.	B
2.	A
3.	C
4.	A
5.	C
6.	B
7.	A
8.	B

THANK YOU FOR CHECKING OUR WORK, BEST OF LUCK!



Doctors slides



Hamad Alkhudhairy



Shrooq Alsomali