

MALARIA IN CHILDREN

OBJECTIVES

- Definition of terms
- Classification of the species
- Epidemiology of Malaria
- Pathogenesis
- Symptoms and signs
- Diagnosis
- Treatment and prevention
- Complications

Introduction

- Malaria is a tropical life threatening disease of humans that is caused by *Plasmodium* protozoa.
- Infection occurs when one is bitten by an infective female *Anopheles* mosquito vector.
- Symptoms may appear within weeks to months or even years.

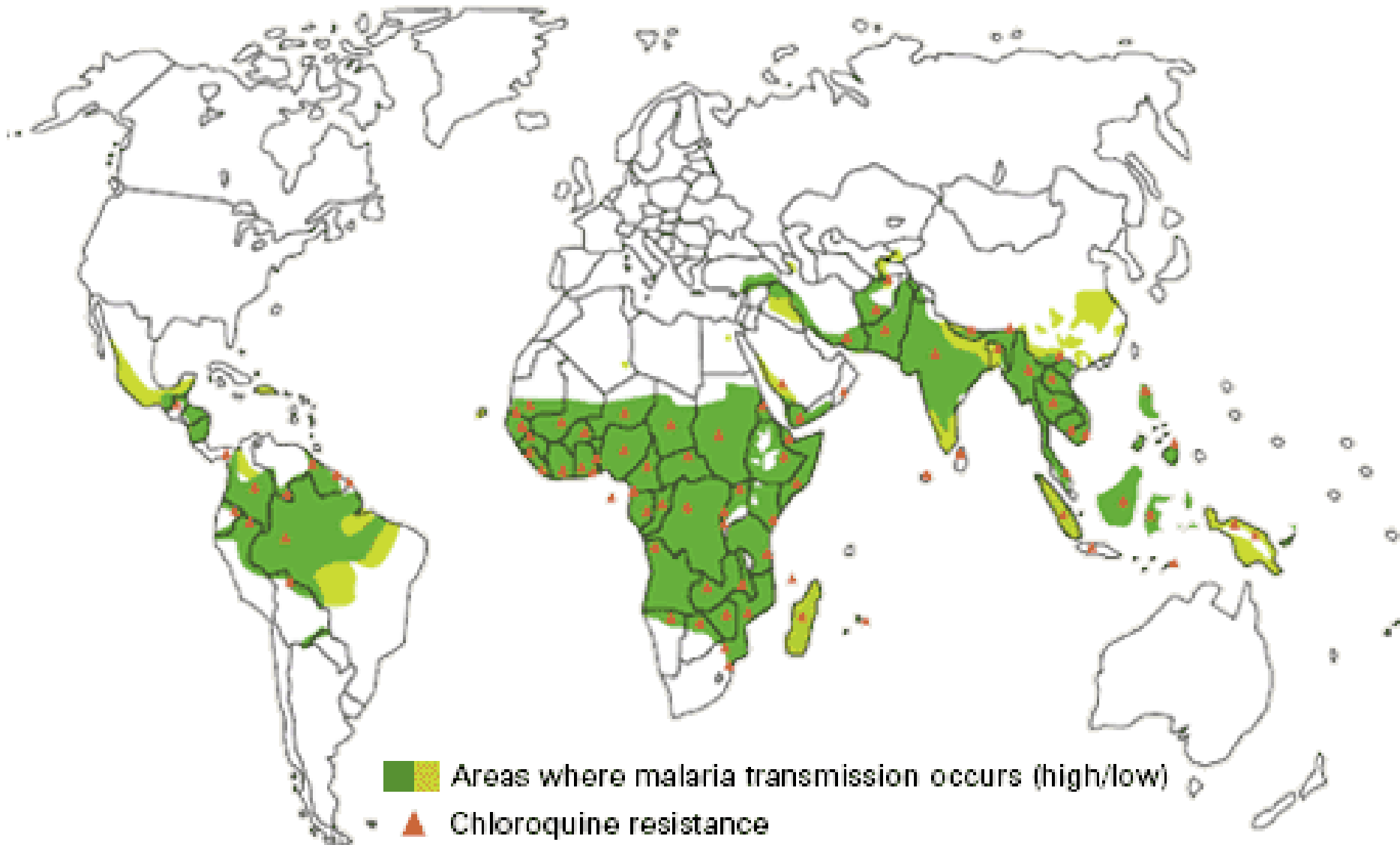
Classification

- There are 4 species:
 - *Plasmodium falciparum*: most severe form of disease
 - *Plasmodium vivax*
 - *Plasmodium ovale*
 - *Plasmodium malariae*

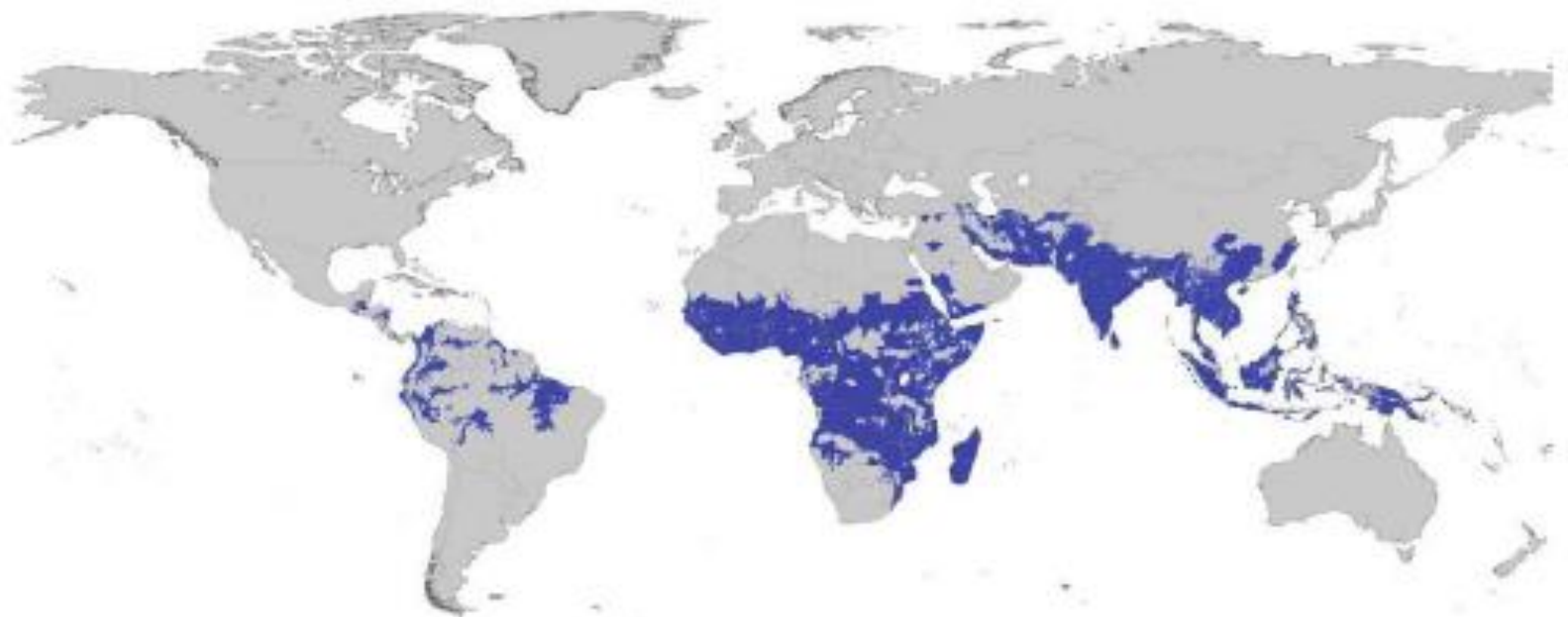
Epidemiology

- Malaria continues to be a major global health problem, with over 40% of the world's population in some 100 countries.
- Malaria is an important cause of morbidity and mortality in children and adults in tropical countries.

Epidemiology



Distribution of Plasmodium falciparum



Pathogenesis

- When Plasmodia enter the blood, they form sporozoites.

Liver stage/ exo-erythrocytic stage

- Sporozoites go to the liver, where they multiply into more sporozoites.
- Then they change into a different form of Plasmodium known as the merozoites.

Cont..

- The merozoites mature to form schizonts which rupture to release more schizonts that go into the red blood cells.

Erythrocytic stage

- The schizonts change into immature trophozoites (the ring forms). These break out of the red blood cells again and again infecting more RBCs. When they do this, the person gets very sick, and shows symptoms of malaria. This happens every few days, and is called a paroxysm.

Cont

- The ring forms then form mature trophozoites which then form Gametocytes which are the forms taken up by mosquitos during a blood meal.
- Then the parasite undergoes a cycle in the mosquito (sporogenic stage).
 - macrogametocyte...ookinete...oocyst rupture to release sporozoites into mosquito saliva which are injected into humans during a blood meal.

Cont..

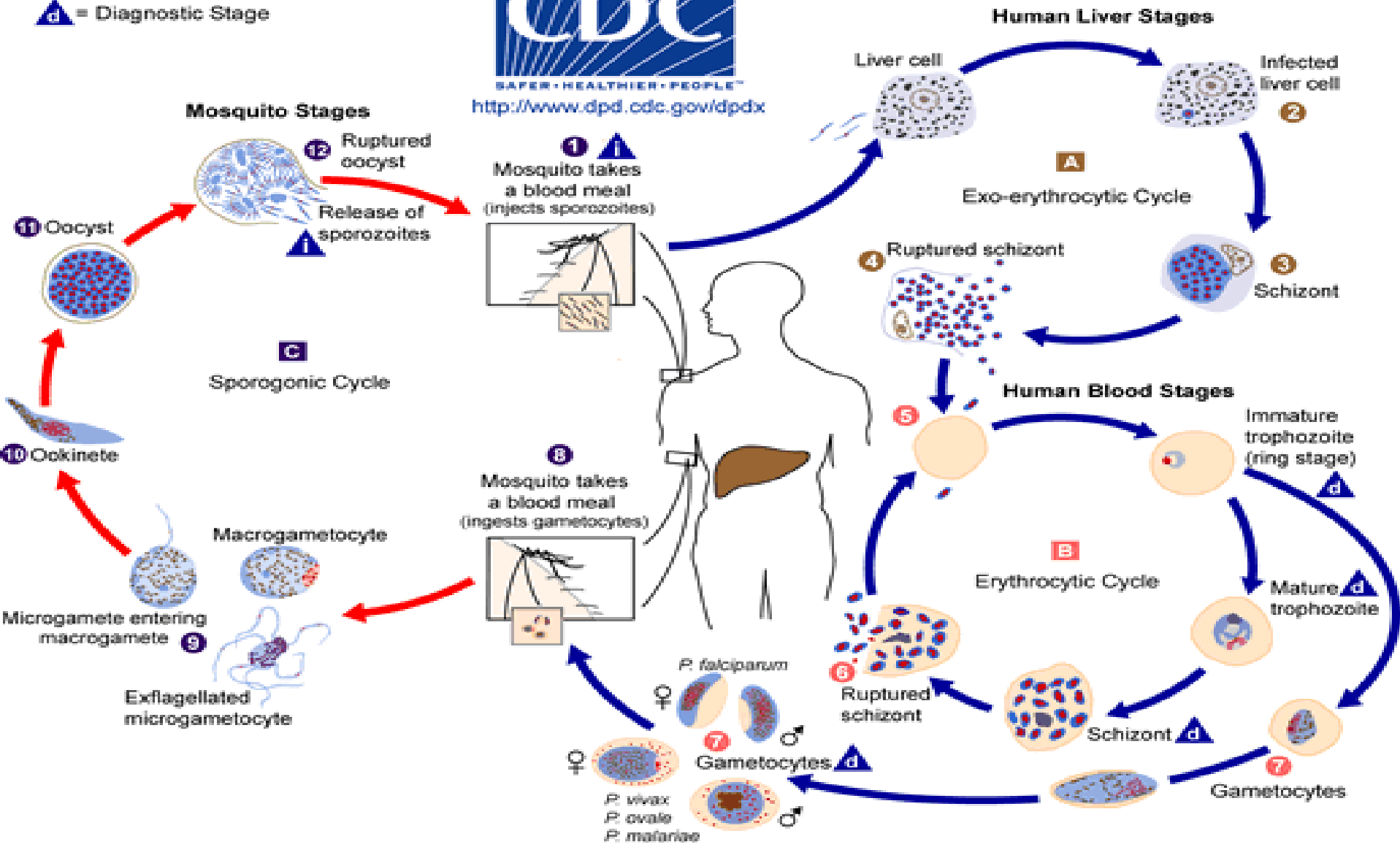
- P. vivax and P. ovale can live in the liver for a long time. A person can look well, but still have the Plasmodium in the liver. This is called a **dormant phase**.
- Weeks or months later, the Plasmodium can leave the liver to the blood, and the person will get sick again.

Pathogenesis

i = Infective Stage
d = Diagnostic Stage



<http://www.dpd.cdc.gov/dpdx>



Symptoms and signs- uncomplicated Malaria

- Depends on the type of malaria:
 - *P. falciparum*: **symptoms**
 - Insidious onset.
 - Malaise, headache, vomiting.
 - Fever- irregular
 - Cough, diarrhea.
 - Fever every 2nd day

Cont..

signs

- Jaundice.
- Tender hepatosplenomegaly.
- Anemia develops rapidly

Cont...

- P.vivax and P.oval:
 - Fever: classically every 48 h – (tertian parasites)
 - Rigors.
 - Gradual hepatosplenomegaly.
 - Anemia develops slowly.
 - Relapse is common.

Cont..

–P.malariae:

- Fever: every third day –(quartan parasite)
- Mild symptoms.
- Parasitaemia may persist for many years.
- Causes glomerulonephritis and nephrotic syndrome in children.

Fever

- Classical stages:
 - Cold stage
 - Hot stage
 - Sweating stage

Diagnosis

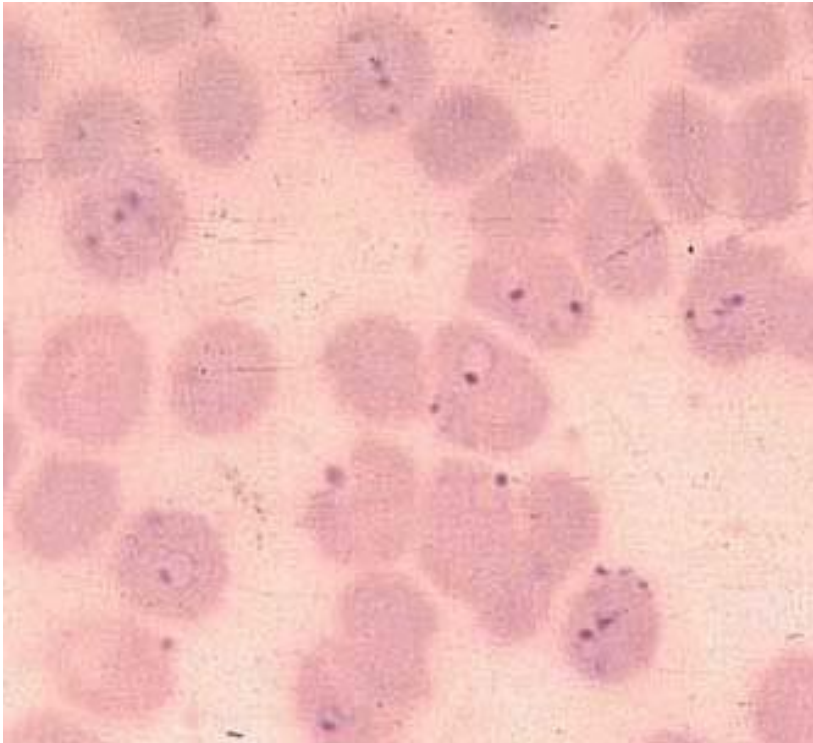
- Malaria should be suspected clinically!!

Laboratory diagnosis:

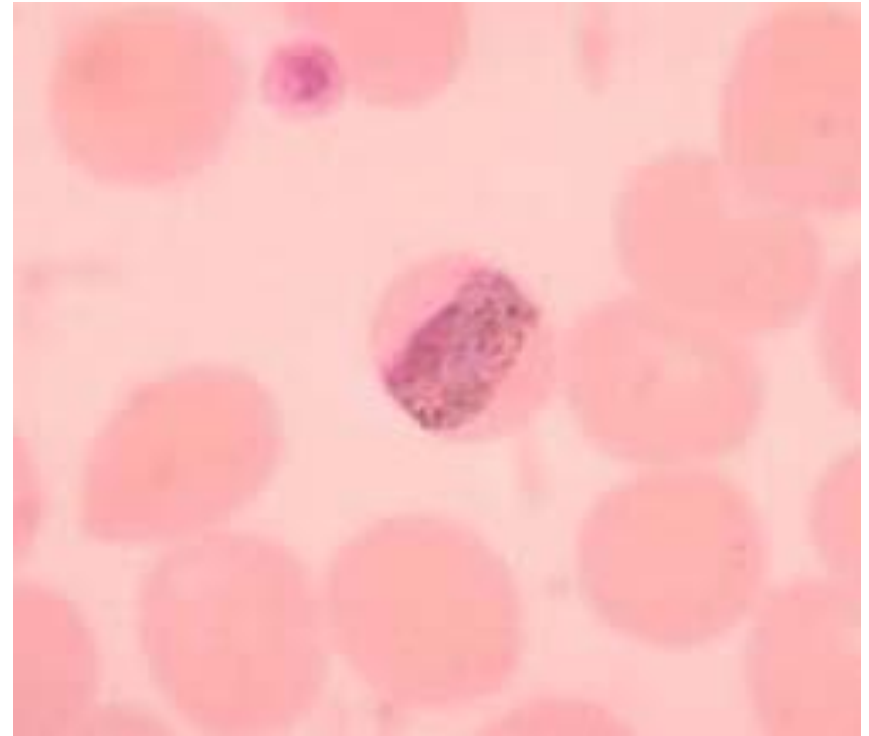
- Thick smear: to identify presence of the parasites
- Thin smear: to identify the specific species

Blood films

- *P.falciparum*

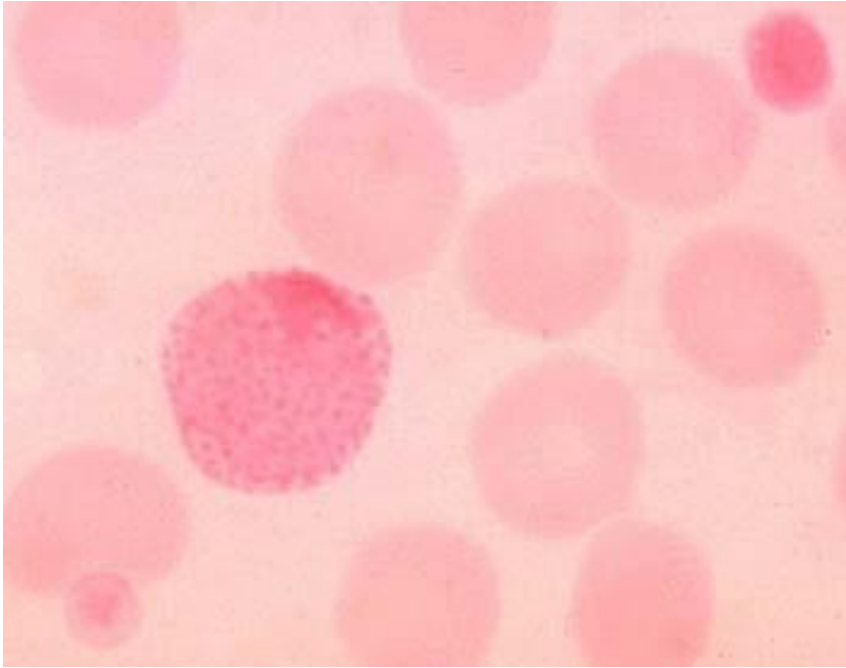


- *P.malariae*

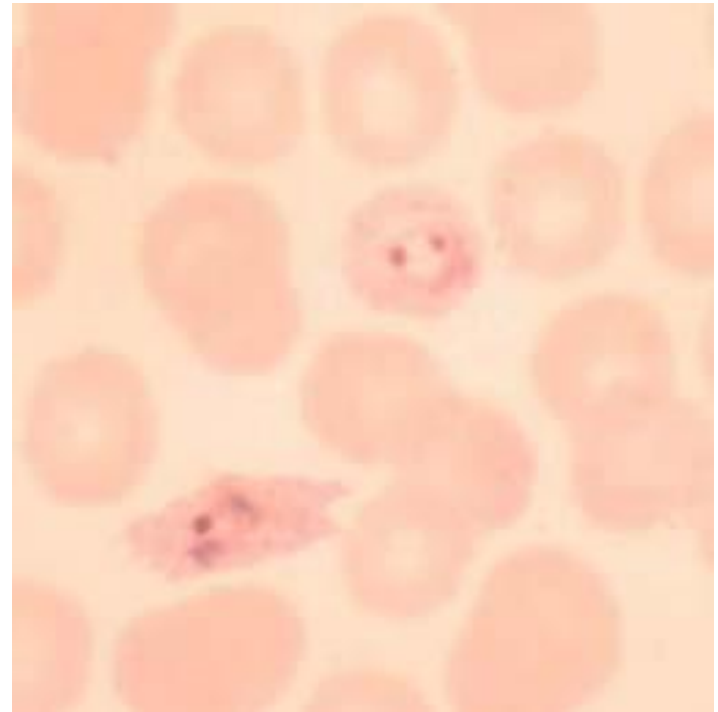


Diagnosis

- *P.vivax*



- *P.ovale*



Laboratory Investigations

- Other tests:
 - Full haemogram: low Hb, low platelets
 - Blood cultures: malaria lowers immunity thus bacterial infections
 - Hypoglycemia
 - Urea and creatinine.

Treatment (based on WHO recommendations 2016)

- Rx of uncomplicated *P.falciparum*
- Rx of severe malaria
- Rx of *P.vivax*, *P.ovale*, *P.malariae*
- Prevention

Definitions

- **Uncomplicated malaria:**
symptomatic malaria without
signs of vital organ dysfunction.

Severe Malaria in African children in endemic areas

- Cerebral malaria'
 - Strictly Coma = AVPU < P (AVPU = U)
 - In practice if AVPU < A or unable to drink
- Severe Malaria with Respiratory Distress
 - Deep, acidotic breathing & usually indrawing
 - Typically associated with anaemia / severe anaemia.
- Severe Anaemia
 - Hb < 5g/dl (<50g/L) or PCV / Haematocrit < 15%
 - As many as 40-50% of children with severe anaemia will NOT have respiratory distress
- **Plus positive diagnostic test**

Best treatment for severe malaria?

Artesunate

- Fewer deaths
- Less incidence of hypoglycaemia, convulsion & coma after admission
- IV bolus or IM

Vs

- **Quinine**

- Higher risk of hyperinsulinaemia & severe hypoglycemia
- IV infusion or IM tds

NB: Artesunate benefits outweigh disadvantages

Artesunate now recommended 1st line in Kenya

Definitions

- **Complicated malaria:**
 - Clinical features:
 - Prostration.
 - Impaired consciousness.
 - Respiratory distress.
 - Convulsions.
 - Circulatory collapse.
 - Pulmonary edema.
 - Jaundice.
 - Abnormal bleeding.

Laboratory features for complicated malaria

- Severe anemia $< 5\text{dg/dl}$
- Hypoglycemia $< 3\text{ mmol/l}$
- Acidosis – Ph < 7.35
- Renal impairment \uparrow urea,
 \uparrow creatinine
- \uparrow lactic acid
- Hyperparasitemia $> 2\%$ of rbc's infected

Treating severe malaria (1)

- **Artesunate (children less than 20kg)**
- Give 3mg/kg on admission and after 12 hours
- Give 3rd dose at 24 hours and then daily doses (max 7 days)
- iv or im routes
- **Give for a minimum 24 hours change thereafter to full course AL as soon as able to drink**
- Use Artesunate 2.4mg/kg in children who weigh over 20kg

If Quinine is used

- Loading dose 20mg/kg
- 10mg/kg 8 hourly
- **Change to full course AL as soon as able to drink**
- **Feed or use IV dextrose to prevent hypoglycaemia**
- Blood transfusion: usually used in children, because anemia is severe (Hb < 5 g/dl)

RX of non severe Malaria

- These children need Oral treatment – AL

Rx of P.vivax, P.ovale, P.malariae

- For radical cure of P.vivax and P.ovale:
 - Primaquine 15 mg daily for 14 days.
 - It destroys the hypnozoite phase in the liver.
 - It may cause hemolysis with G6PD deficient patients.

Prevention

- Avoid mosquito bites:
 - Wearing long sleeves, trousers.
 - Nets.
 - Repellent creams or sprays.
- Eradication from the environment: spraying, clear bushes and stagnant waters.

Prophylaxis: drugs

thanks