Parasitic diseases

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Introduction

- **Predation**: Relationship between two species where member of one species (predator) consumes the member of another species(prey).Ex.Carnivorous animals.
- **Symbiosis**: Close living arrangement between two species.
- **Mutualism**: an association in which both organisms benefit. Ex.Relationship between nitrogen fixing Rhizobium bacteria and several leguminous plants such as beans,peanuts.
- **Commensalism**:one species derives food and shelter from other without affecting host. Ex. Bacterial flora living on human skin.

- **Parasitism:** A relationship between two species where member of one species derives food and shelter from member of another species affecting wellbeing of host.
- Three major groups of parasites infecting human beings are:

1) Protozoa- Amoebae, flagellates, sporozoa,ciliates
2) Helminths – Trematodes, Cestodes ,Nematodes
3) Arthropods – blood sucking parasites like ticks, fleas,lice,mites etc.

- General scheme of classification :

Empire→ Kingdom → Phylum→Class →Order →Family →Genus →Species

- Types of parasites:

- **Endoparasite:** malarial parasite
- **Ectoparasite:**Sarcoptes scabiei(mite producing scabies)
- Obligate parasite-Malarial parasite
- facultative parasite- Naegleria fowleri
- Accidental parasite-Ecchinococcus granulosus infection in human

- **Types of hosts:**

1. **Definitive host:** host in which the parasite undergoes sexual multiplication
2. **Intermediate host:** host in which the parasite undergoes asexual multiplication.
3. **Reservoir host** : source of infection.

- **Vectors:** Arthropods that transmit parasites to host.

- Biological vector: tsetse fly for T.brucei.
- Mechanical vector: House fly for amoebiasis.

MALARIAL PARASITE

- Kingdom: Protista
- Class: sporozoea
- order:Haemosporida
- Genus:Plasmodium
- Species: In man commom species are P.vivax, P.falciparum,P.ovale and P.malariae.
- Found allover the country, Tropical zone is endemic for all the species.
- P.vivax is common in temparate zone.

Life cycle

- In two host.
- **In man:** Inside the liver cells and RBC.Reproduce by asexual method called **Schizogony**- so man is intermediate host.
- **In mosquito:** In female anopheles mosquito.Sexual form first developed in human host and then transferred to mosquito where they further develop.Reproduction occur by sexual method called **sporogony**-so mosquito are definitive host.

Human life cycle

- Pre erythrocytic phase
- Erythrocytic phase
- Gametogony
- Exo erythrocytic cycle

Mosquito lifecycle

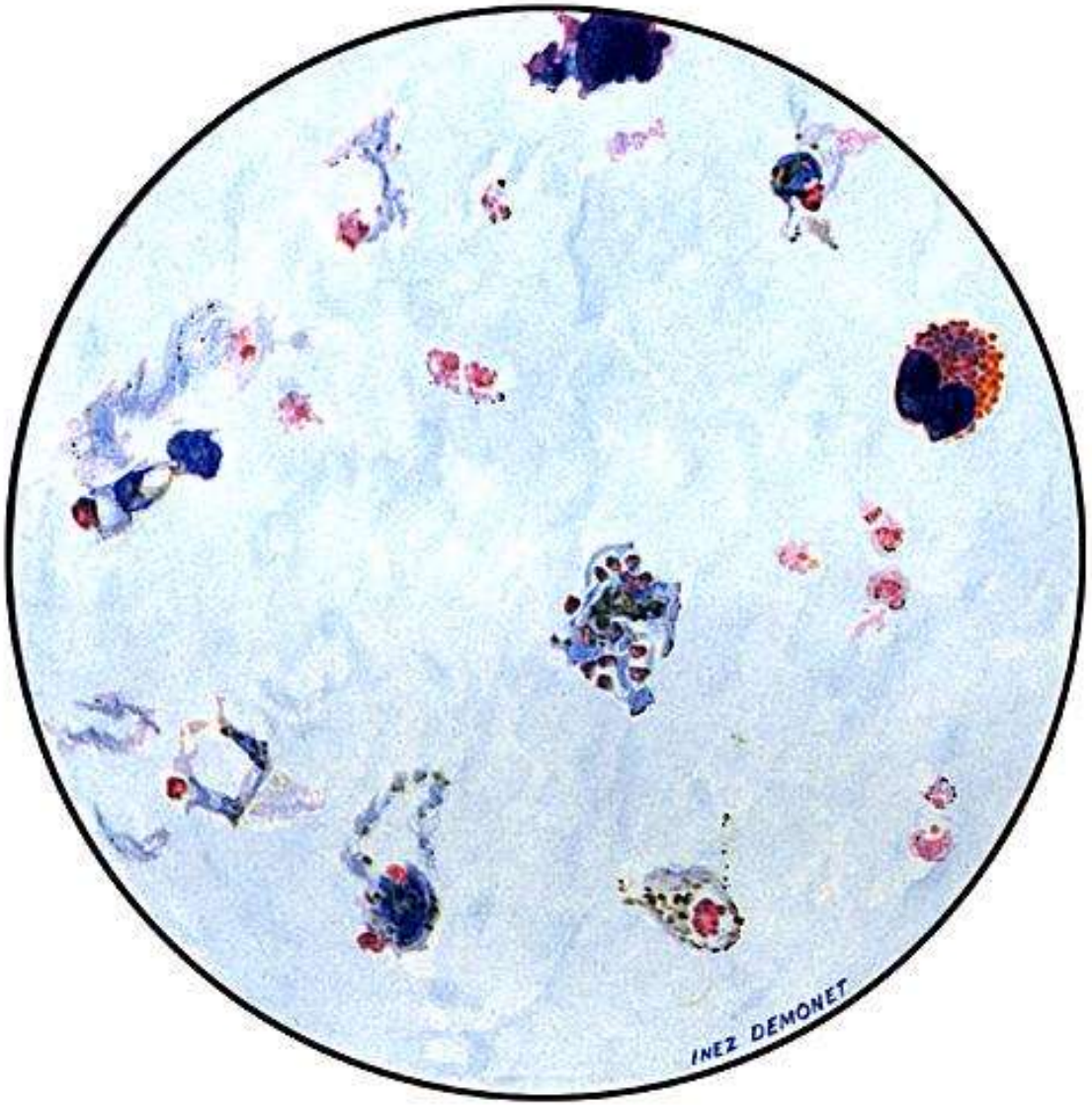
- Sexual cycle started in human host by formation of gametocytes.They transferred to mosquito during blood meal.
- Female anopheles mosquito ingest both sexual and asexual forms but asexual forms die off.
- Carrier must contain 12 gametocytes/cumm of blood.

Morphology

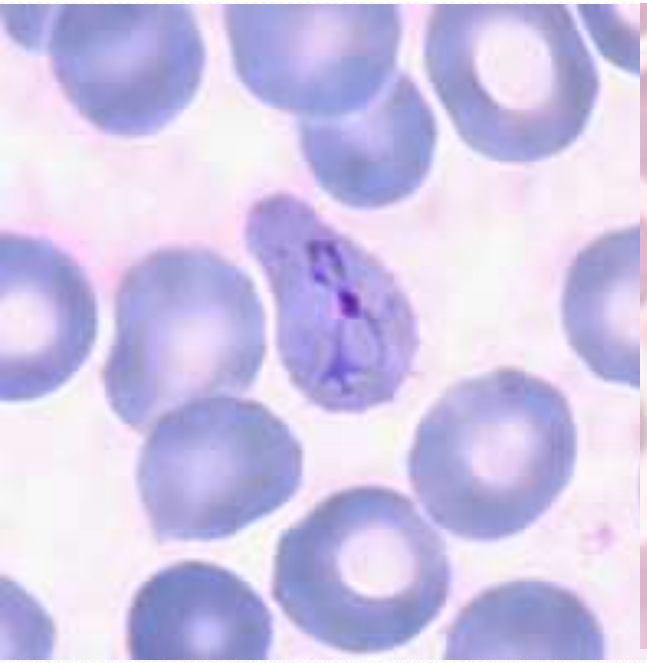
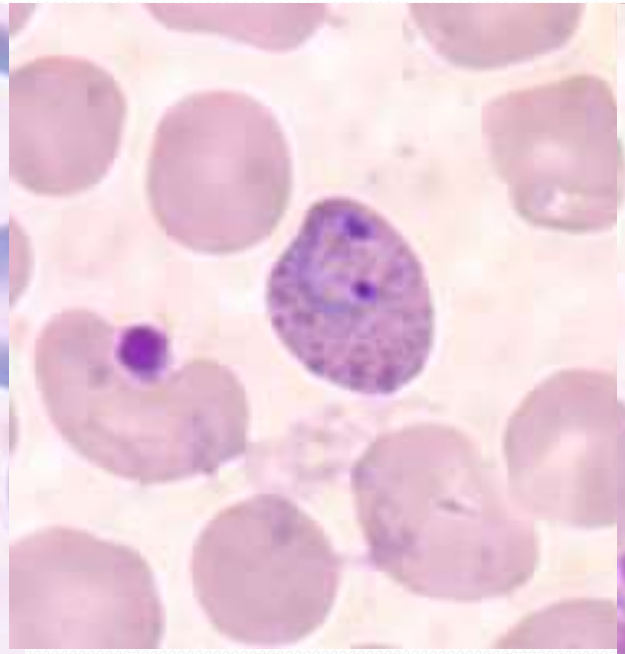
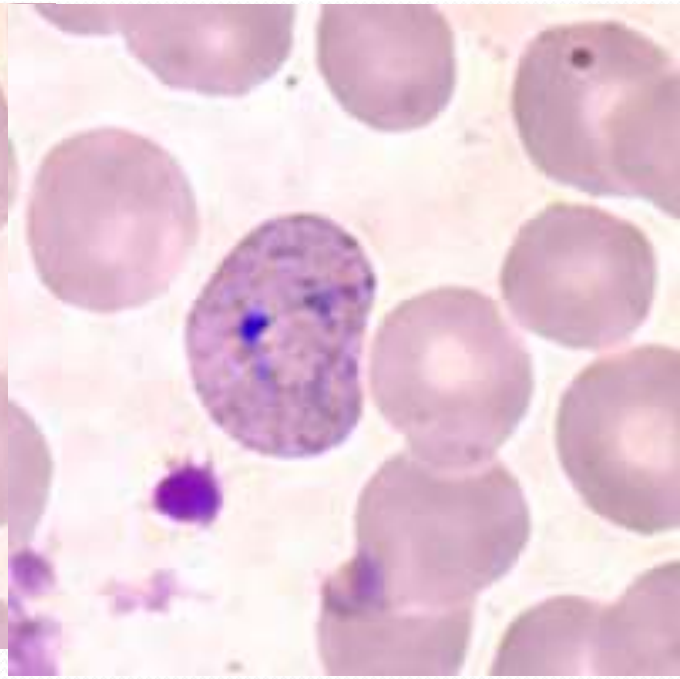
	P.vivax	P.falci
Pre erythrocytic schizogony	Lasts for 8 days	Lasts for 6 days
	Liberated merozoites can reenter the liver and can cause relapse.	No exo-erythrocytic cycle
Erythrocytic schizogony	Greater tendency to invade young RBC	Invade reticulocytes,old and young RBC
	Take place in peripheral blood	In capillaries of internal organs(Spleen,BM)
	Each RBC infected with only one parasite	More than one parasite may infect one RBC
	3 stages found:Trophozoite,schizont,merozoite	Only ring form found in peripheral blood
	Lasts for ~8–72 hrs	Lasts for 6–8 hrs

Ring form	Cytoplasm opposite to nucleus is thicker	Cytoplasm is thin and uniform.Often 2 nuclei and accole form seen.
RBC	Enlarged and schuffner's dots are seen	Unaltered,reddish violet maurer's dots are seen
schizont	Large 9-10µm,round; nucleus divide to give 12-24 daughter merozoite arranged in rosette	4.5-5 µm,divide in 8-32 merozoites; not seen in peripheral blood.
gametocytes	Merozoite from single schizont become all male(microgametocyte)or female(macro)	Sickle shaped ; Host red cell used up ,only rim remained
	Appear 16 days of infection	Appear on 21 day of infection
Malarial pigment	Yellow brown	Darkbrown or black

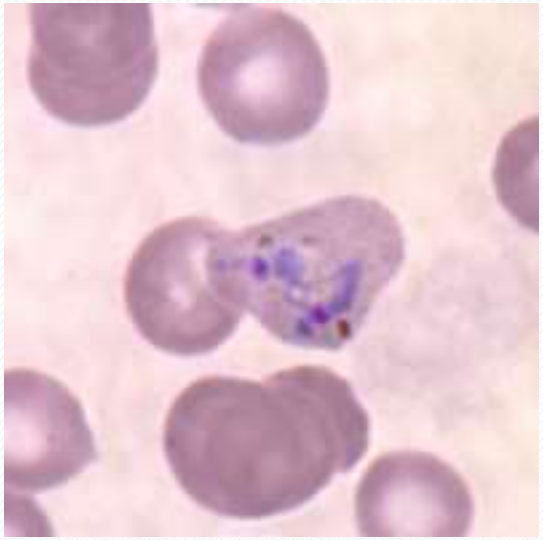
P. Vivax - Thick smear

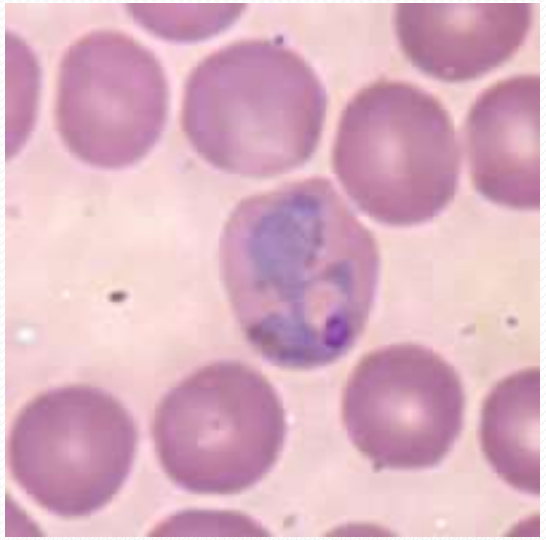


P. Vivax – ring form

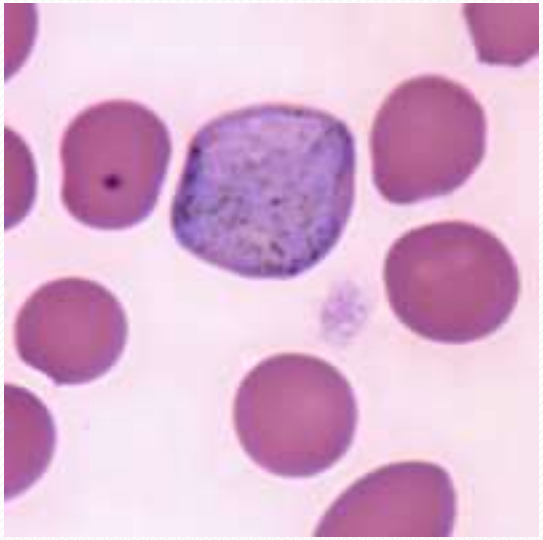




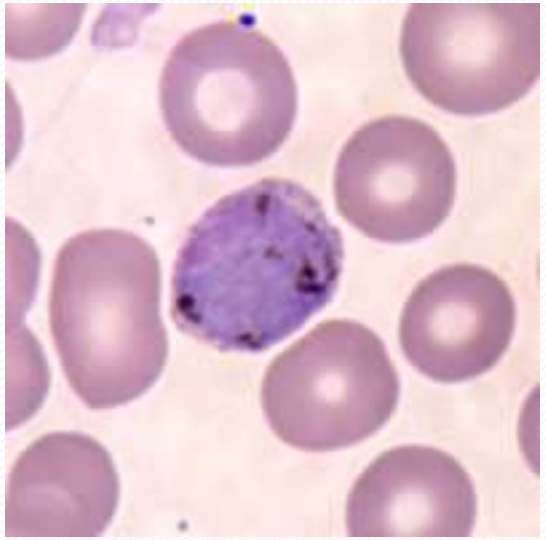
P. Vivax - trphozoites



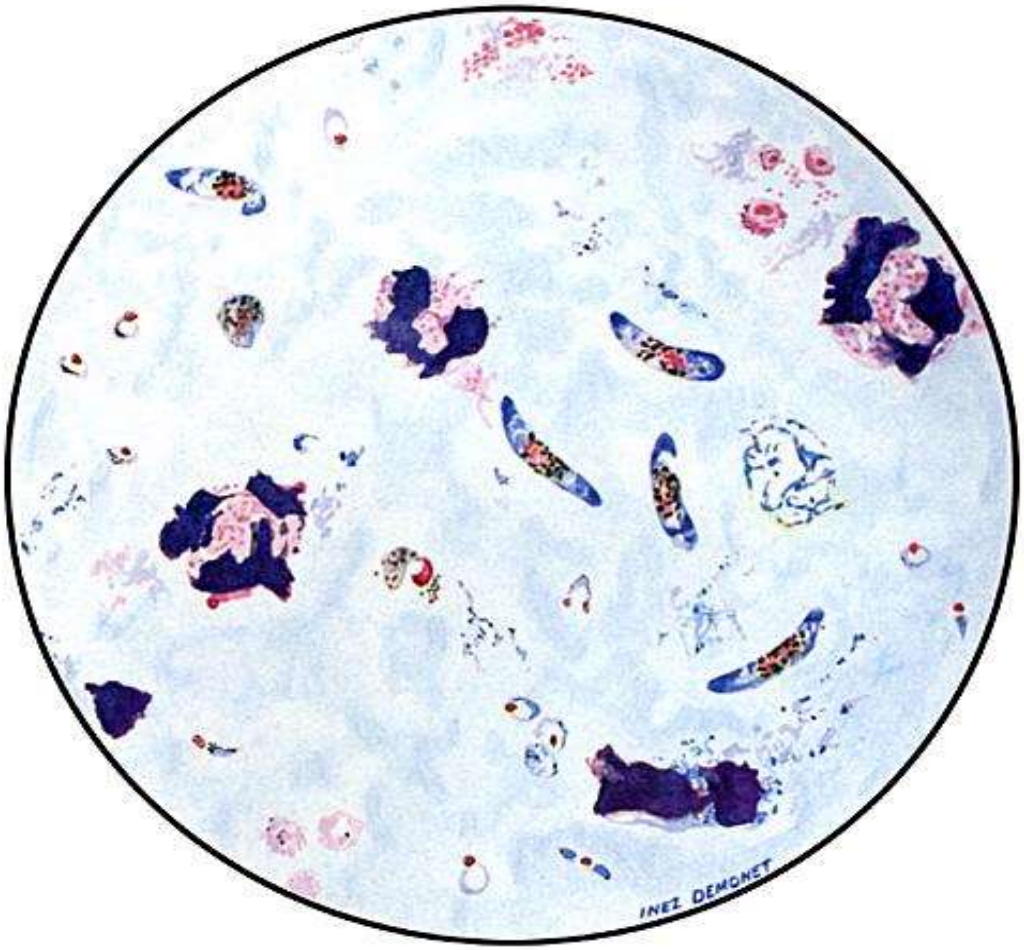


P. Vivax - Gametocytes

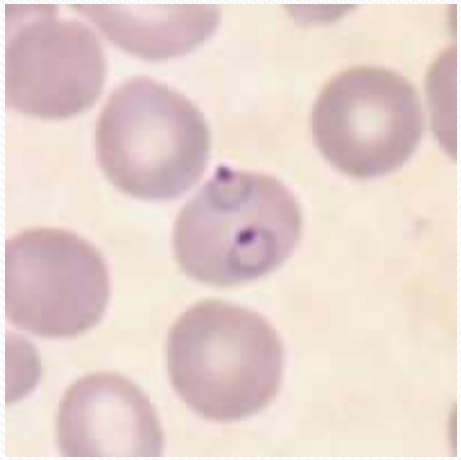


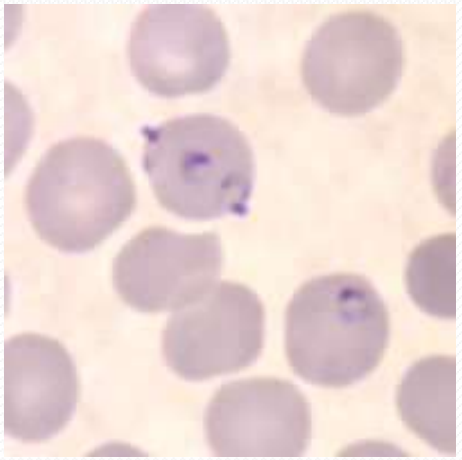


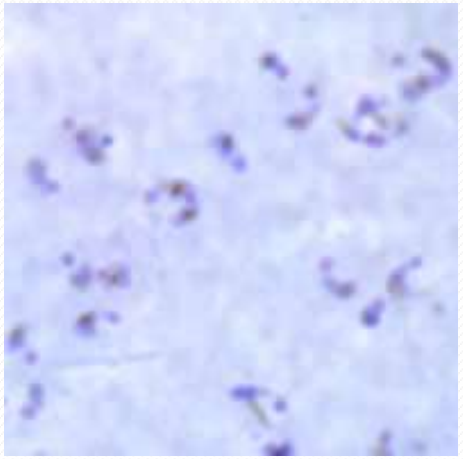
P. Falciparum – thick smear



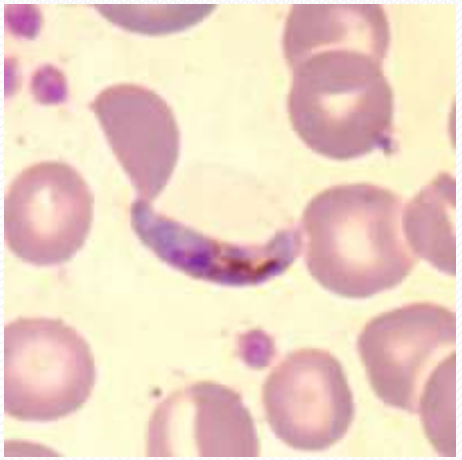
P. Falciparum – Ring form

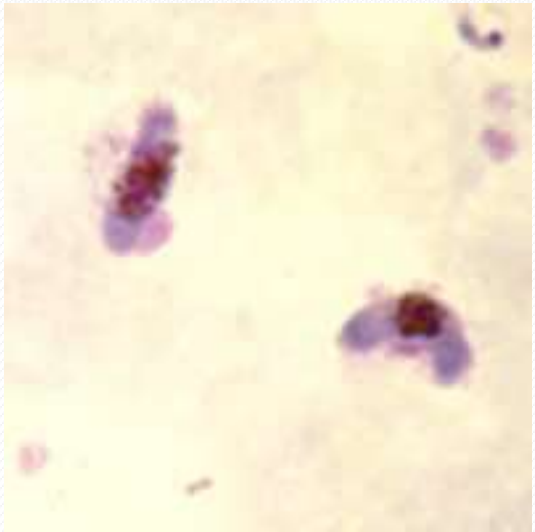






P. Falciparum gametocytes





CLINICAL FEATURES

- FEBRILE PAROXYSM:3 stages
  - Cold stage(20min to 1 hr)
  - Hot stage(1to 4 hrs)
  - Sweating stage(2 to 3 hrs)
  - Weakness,bodyache,fatigue,headche
- ANEMIA
- SPLENOMEGALY
- ICTERUS

COMPLICATIONS

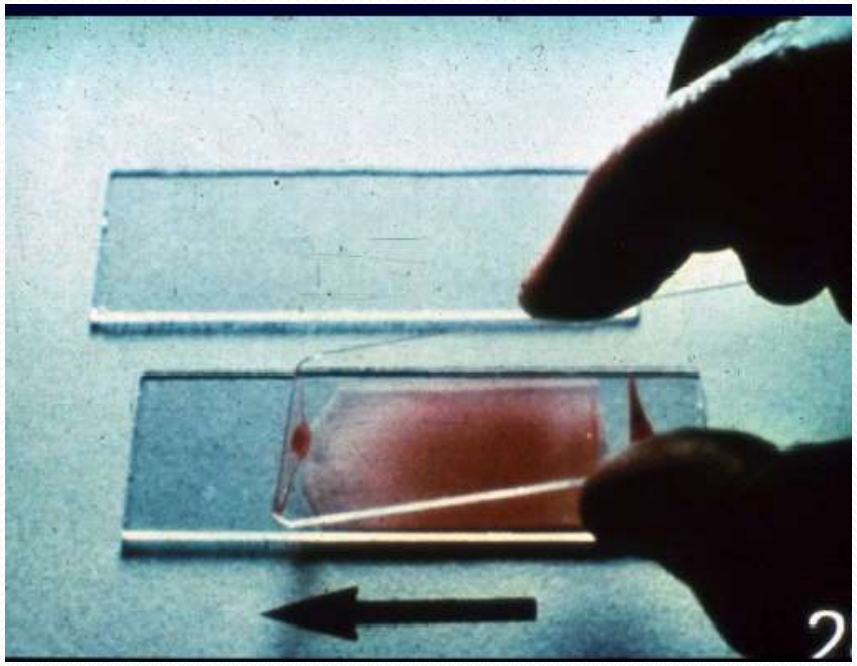
- **PERNICIOUS MALARIA:** more than5% RBCs are infected
- **CEREBRAL MALARIA**:hyperpyrexia,convulsion, coma
- **BLACK WATER FEVER**: Repeated infection ,antigen antibody mediated hemolysis,hemoglobinuria
- **Renal failure**
- **Algid malaria**:when associated with GIT symptoms
- **Bleeding** from gums,nose,GIT due to DIC

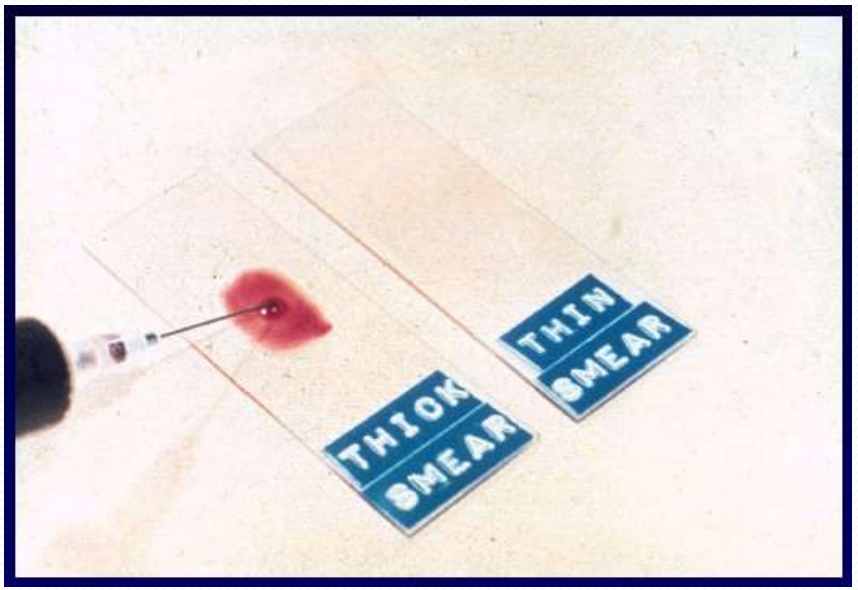
- Genetically determined conditions conferring protection against death from malaria:
- Sickle cell trait
- Ovalocytosis
- G6PD deficiency
- Absence of Duffy blood group antigen
- Infants are protected

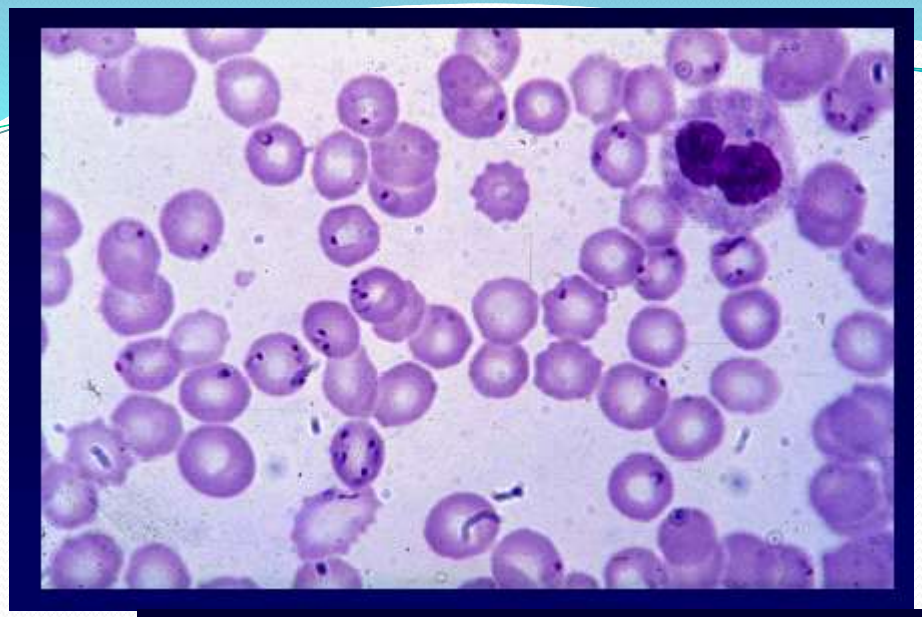
LABORATORY DIAGNOSIS

- PERIPHERAL SMEAR EXAMINATION- Thin and thick –RBC,WBC,Platelets
- HRP-2-specific for P.falci
- P-LDH
- QBC
- PCR
- Immunochroatographic antigen capture test
- Fluroscence microscopy

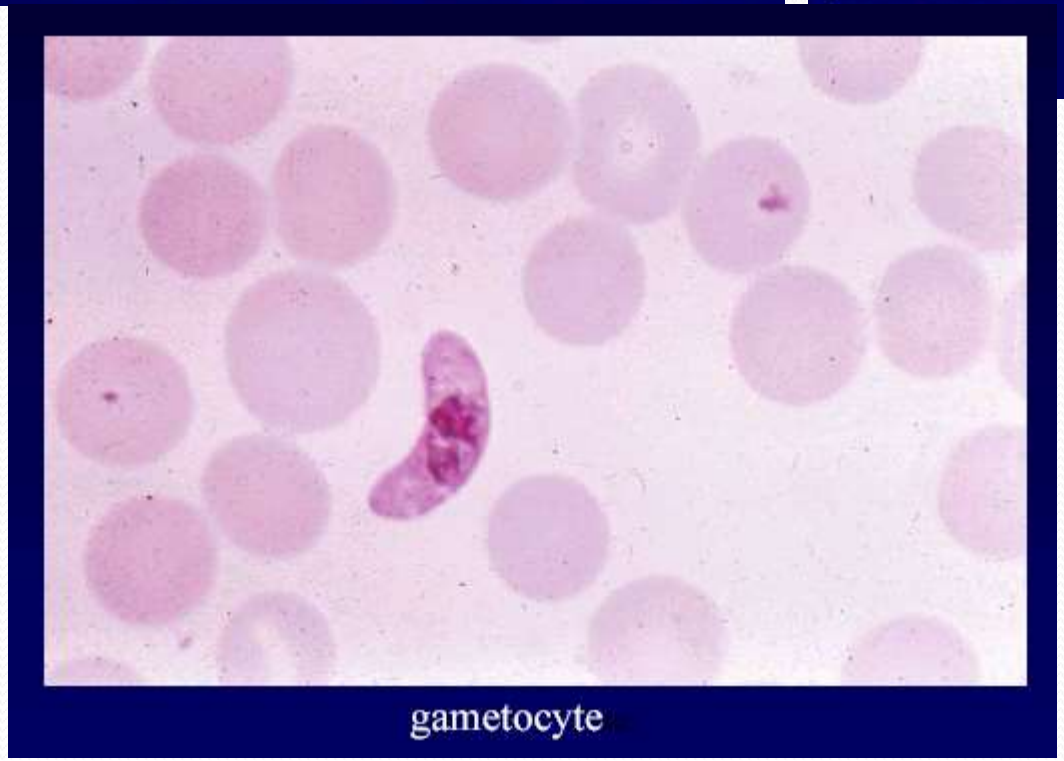
Making of Thin & Thick films







red cell schizont



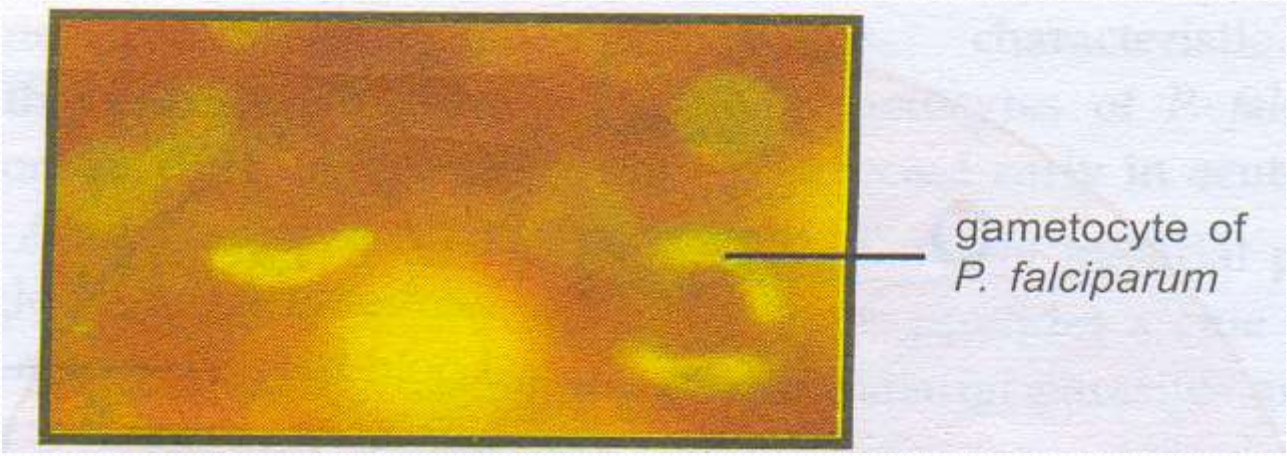
gametocyte

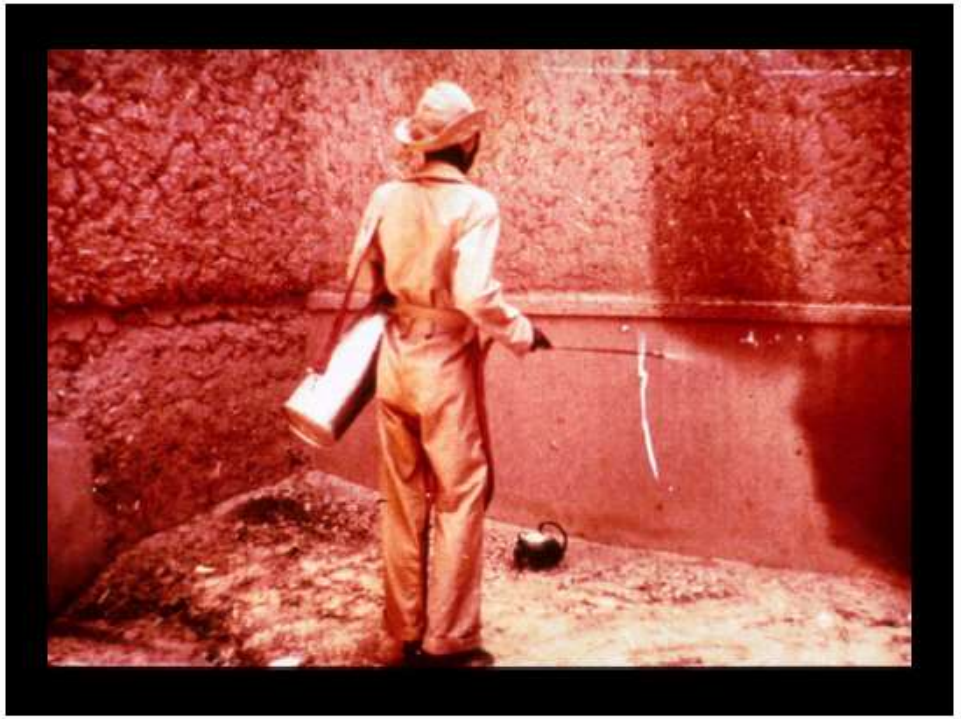
Counting the % age of parasitised RBCs

- On thin blood films
- When falciparum malaria parasitemia is high
- Method of counting:
  1. Select an area where no of RBCs is roughly 250.
  2. Count the no of parasitised RBCs in 4 such fields i.e. approximately 1000 RBCs.
  3. Divide by 10 to obtain the percentage.

*WHO – if it is >5%, then the parasitemia is heavy & prognosis is poor.

Quantitative Buffy Coat





THANK YOU