

Malaria 2

Clinical Parasitology

FACTM (Clinical) Pt 1

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Malaria series

Malaria 1 Clinical Tropical Medicine

Malaria 2 Clinical Parasitology

Malaria 3 Public Health, Travel & Expedition Medicine

Malaria 4 Clinical Entomology



Study materials

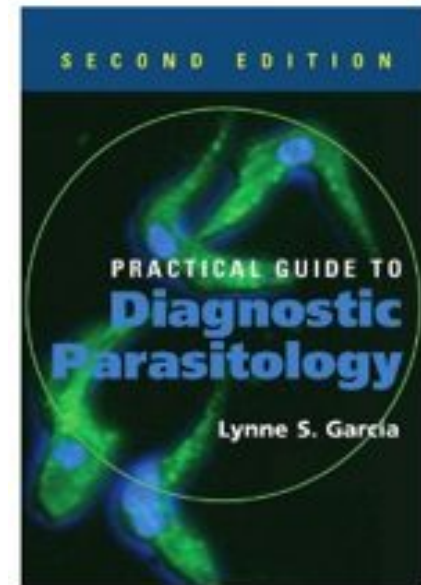
Practical Guide to Diagnostic Parasitology.
2nd Edition, Garcia LS. 2009. ASM Press.

- Recommended bookshelf
- FACTM study notes
- Specialist review articles
- Self-assessment questions

Blog <http://micrognome.priobe.net>

Web www.priobe.net

FACTM <http://lifeinthefastlane.com/exams/actm-fellowship/>



Parasitology introduction

Plasmodium

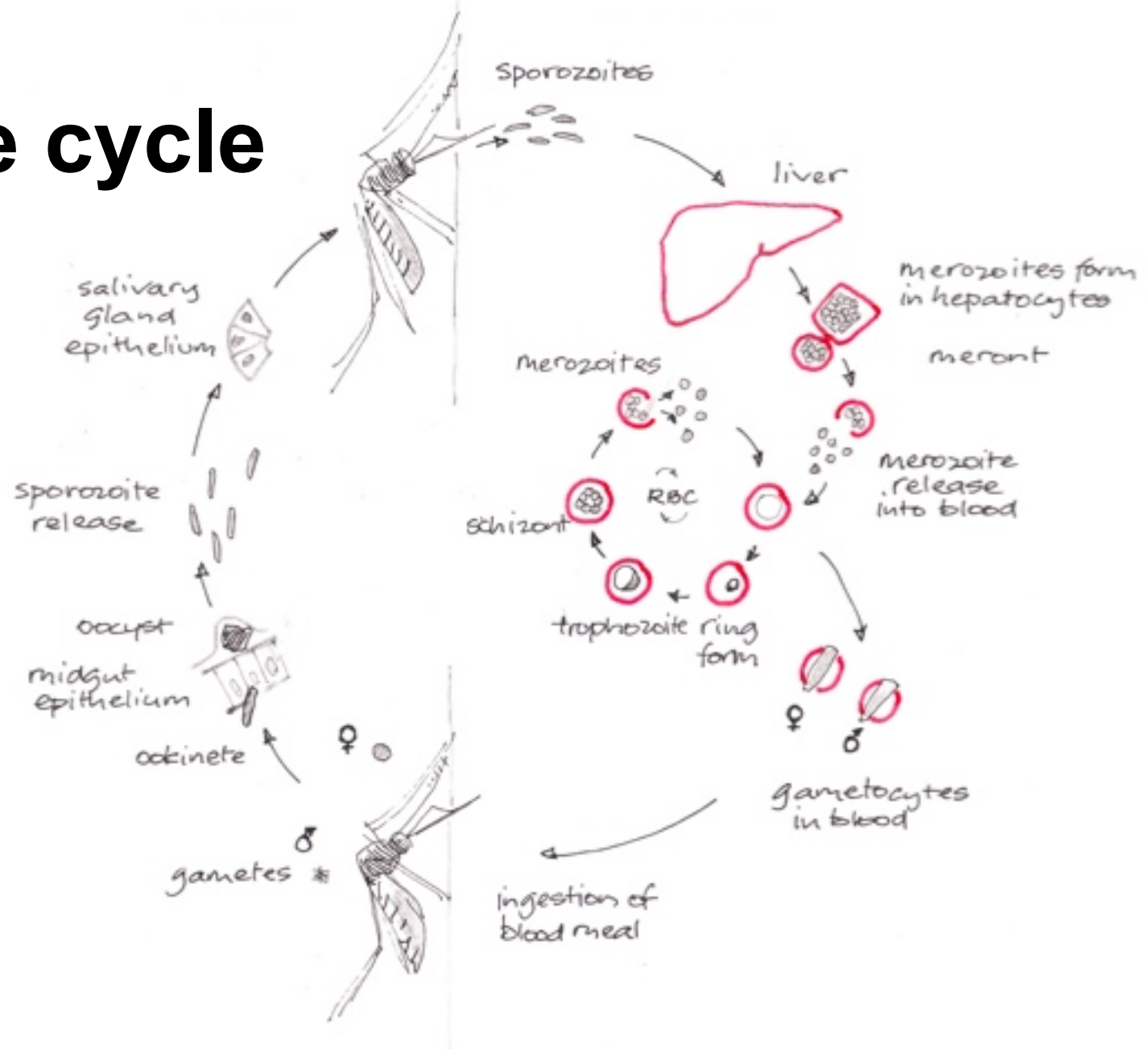
- **protozoan** – unicellular, nucleated Sporozoan, Apicomplexa
- **life cycle** – multiple stages in mammals or birds & mosquito
- **asexual cycle** – schizogony in animals
- **sexual reproduction** – sporogony, requires mosquito



Life cycle

MOSQUITO

HUMAN



Key differences

<i>Plasmodium</i> sp.	severity*	cycle	IP	count x10 ⁹ /L	persistence
<i>P. falciparum</i>	malignant	48hr	12d	5e4 – 5e5	early relapse
<i>P. vivax</i>	benign	48hr	14d	2e4	extraerythrocytic
<i>P. ovale</i>	benign	48hr	15d	9e3	extraerythrocytic
<i>P. malariae</i>	benign	72hr	15-30d	6e3	no EE stage

* relative: individual infections may vary in outcome



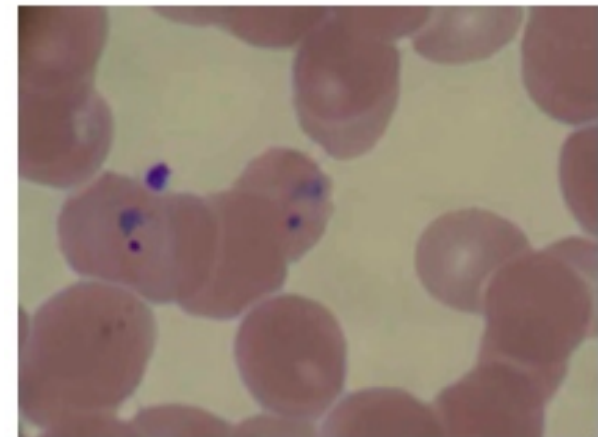
Investigations

- **Key questions:**
 - Does the patient have malaria?
 - Does the patient have *P. falciparum* malaria?
 - Does the patient have another infection?
- **Blood films:** at least 2, preferably 3 at intervals by 2 methods (thick & thin), for parasite detection, count, determination of species & stages present
- **Rapid tests:** dipstick for *P. falciparum* histidine-rich protein II, quantitative buffy coat, and PCR assays; mainly for *P. falciparum* infection, not useful for parasite count



Rapid antigen test

- **HRP II:**
 - only useful for *P. falciparum*
 - may detect *P. vivax*
 - more sensitive than thin film
 - comparable with thick film
 - be aware of potential FP
 - supplements blood film
- **Alternative rapid tests:**
 - QBC
 - real time PCR



Blood films

2 methods

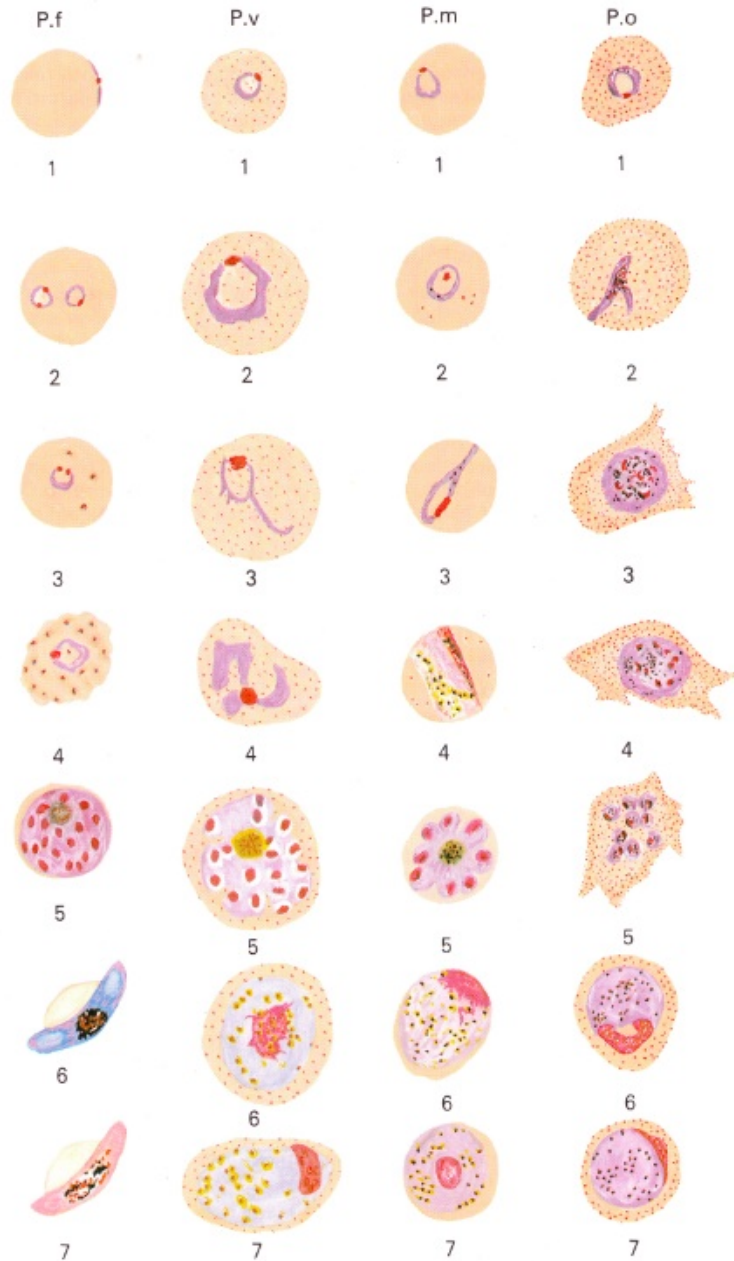
– Thick

single drop of blood & Geimsa stain
around 30x as sensitive as thin film
requires experience to interpret
may pick up mixed infection

– Thin

less sensitive but easier to read
examine optimal part of blood film
parasite features easier to recognise
needs repetition x 2-3
% RBC affected
can miss low level parasitaemia and dual infections

Plasmodium recognition chart



KEY

- 1-4 trophozoites
- 5 schizont
- 6 macrogamete
- 7 microgamete

P.f *Plasmodium falciparum*

P.v *Plasmodium vivax*

P.m *Plasmodium malariae*

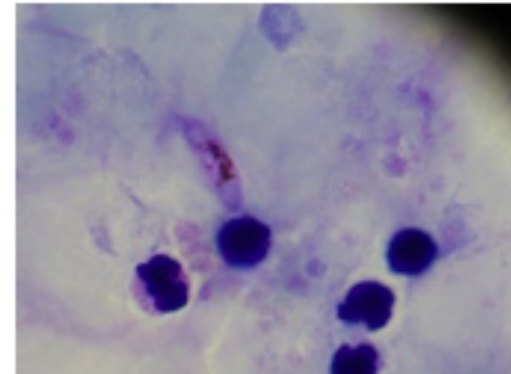
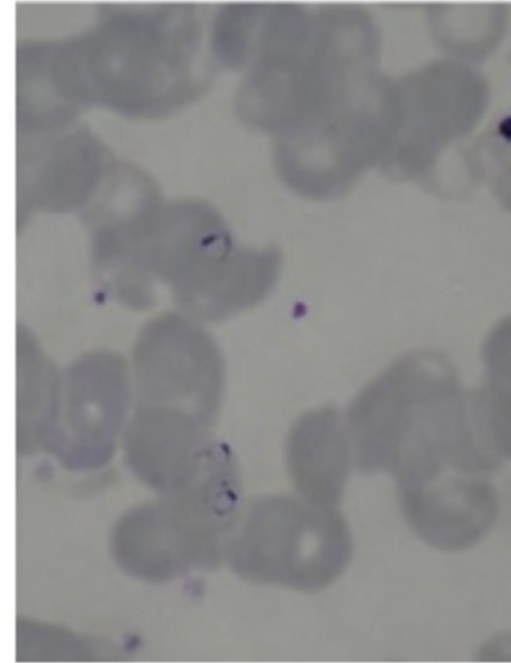
P.O *Plasmodium ovale*

Inglis TJJ. Churchill's Pocketbook of Clinical Microbiology.
Churchill Livingstone, Edinburgh, 1997.



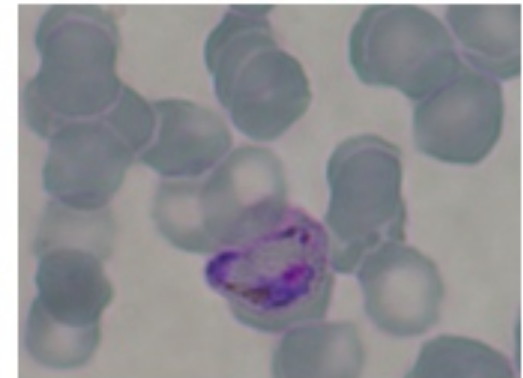
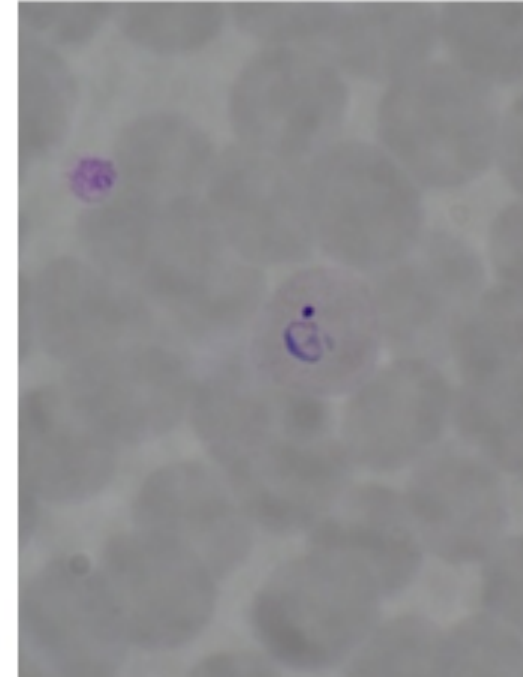
P. falciparum

- **trophozoite:** accolé form, multiple per RBC, double chromatin dots, Maurer's dots, crenated RBC, high % RBCs infected
- **schizont:** rarely seen, except severe infections, tightly clumped merozoites, malaria pigment
- **gametocytes:** crescent or banana-shaped
- dual infection with *P. vivax* may not show up on thin film



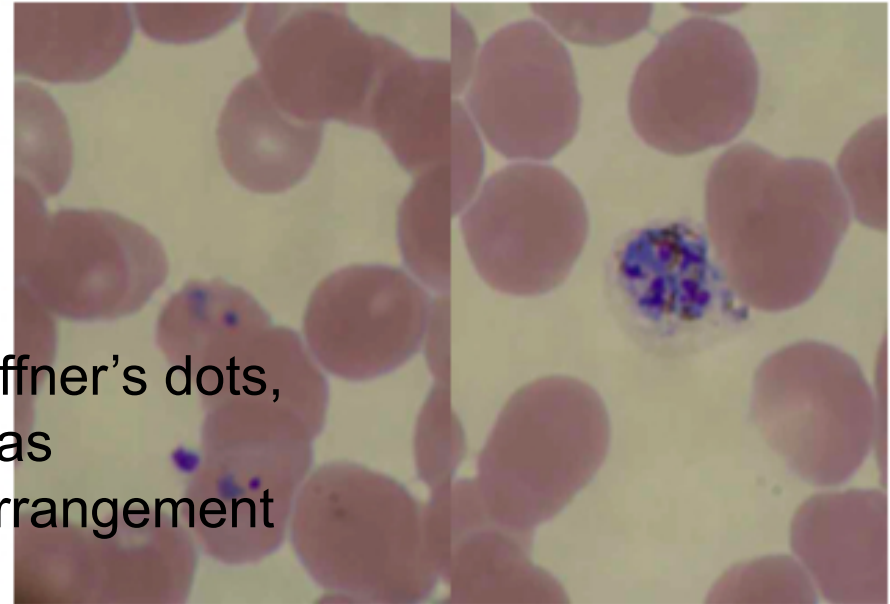
P. vivax

- **trophozoite:** single per RBC, single chromatin dots in early forms, thicker ring forms, Schuffner's (pink) dots, amoeboid cytoplasm, lower % RBCs infected, shape of RBC unchanged
- **schizont:** more often seen, less tightly clumped 12-24 merozoites, malaria pigment
- **gametocytes:** ovoid shaped, if seen



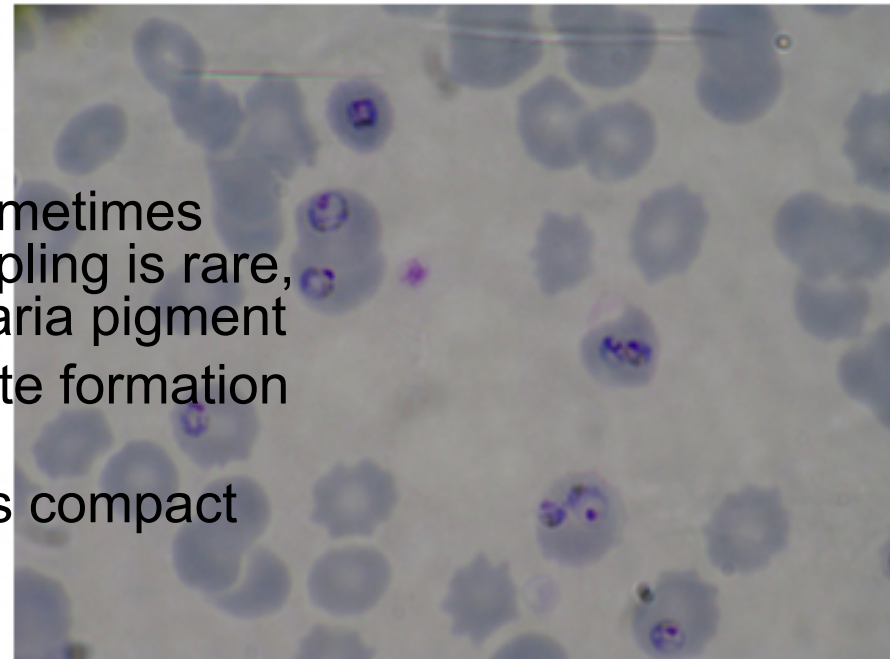
P. ovale

- **trophozoite:** thicker ring forms, oval shaped RBCs, prominent Shuffner's dots,
- **schizont:** 4-14 merozoites, RBC has jagged edge, irregular merozoite arrangement
- **gametocyte:** irregular nucleus



P. malariae

- **trophozoite:** thicker ring forms, sometimes central 'owl's eye appearance, stippling is rare, late band form with prominent malaria pigment
- **schizont:** 6-12 merozoites in rosette formation around malaria pigment
- **gametocyte:** microgametocyte has compact nucleus



Emerging issues

1. Mechanisms of Plasmodium pathogenesis
2. Where *P. falciparum* goes
3. Vulnerability points in the life cycle
4. Immunity to *Plasmodium* spp.
5. Zoonotic malaria: *P.knowlesi*



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