Malaria

epidimiology

- 219 million cases.
- 435,000 deaths estimated in 2017

- Four species of the genus Plasmodium classically cause human malaria
- Plasmodium falciparum is responsible for nearly all severe disease
- P vivax.
- Plasmodium ovale and Plasmodium malariae are much less common

Malaria is transmitted by the bite of infected female anopheline mosquitoes.

During feeding, mosquitoes inject sporozoites, which circulate to the liver, and rapidly infect hepatocytes, causing asymptomatic liver infection. Merozoites are subsequently released from the liver, and they rapidly infect erythrocytes to begin the asexual erythrocytic stage of infection that is responsible for human disease.

Malaria may uncommonly be transmitted from mother to infant (congenital malaria),

by blood transfusion.

In P vivax and P ovale, parasites also form dormant liver hypnozoites, which are not killed by most drugs, allowing subsequent relapses of illness after initial elimination of erythrocytic infections

LIBYA: MALARIA

Deaths	%	Rate	World Rank
0	0.00	0.00	183

According to the latest WHO data published in 2018 Malaria Deaths in Libya reached 0 or 0.00% of total deaths. The age adjusted Death Rate is 0.00 per 100,000 of population ranks Libya #183 in the world. Review other causes of death by clicking the links below or choose the full health profile.

Four species are encountered in human disease:

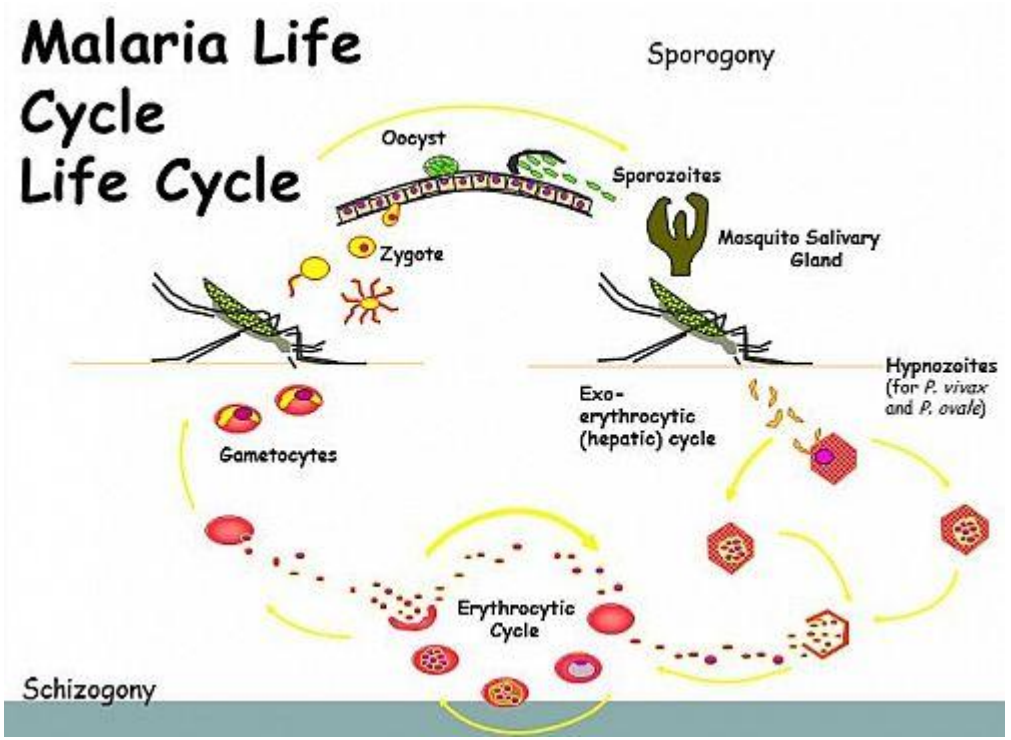
***Plasmodium falciparum*, which is responsible for most fatalities;**

***P. vivax* and *P. ovale*, both of which cause bening tertian malaria (febrile episodes typically occurring at 48-h intervals);**

***P. malariae*, which causes quartan malaria (febrile episodes typically occurring at 72-h intervals);**

Parasitology

The female mosquito becomes infected after taking a blood meal containing gametocytes the sexual form of the malaria parasite. The developmental cycle lead to sporozoites that migrate to the insect's salivary glands. The sporozoites are inoculated into a new human host.

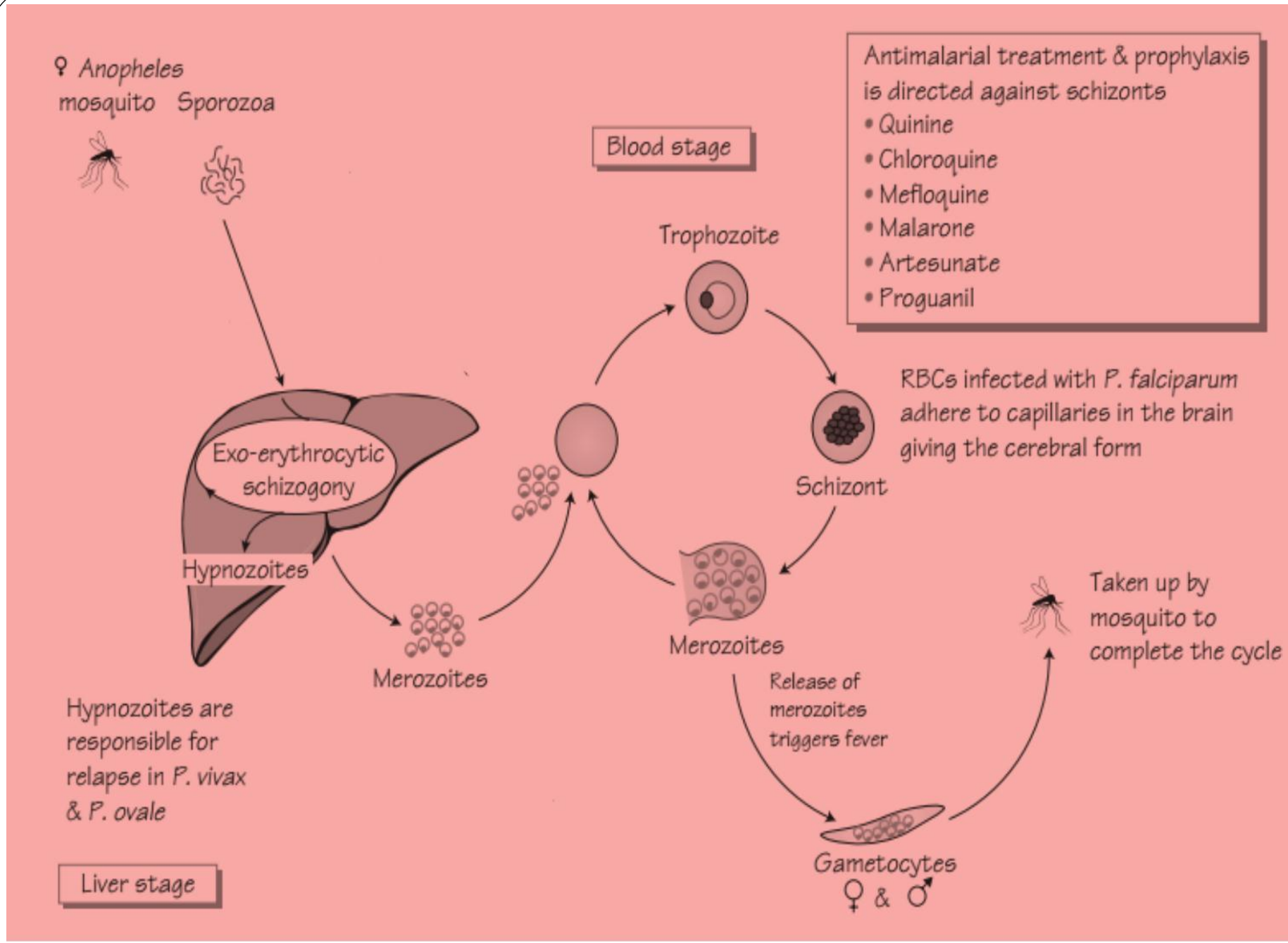


Parasitology

- Spoerozoite multiply inside hepatocytes as merozoites: this is pre-erythrocytic (or hepatic) sporogeny. After a few days the infected hepatocytes rupture, releasing merozoites into the blood from where they are rapidly taken up by erythrocytes.

Parasitology

- **Inside the red cells the parasites again multiply, changing from merozoite, to trophozoite, to schizont, and finally appearing as 8-24 new merozoites. The erythrocyte ruptures, releasing the meozoites to infect further cells.**
- **Each cycle of this process, which is called erythrocytic schizogeny, takes about 48 hours in *P. falciparum, P. vivax* and *P. ovale*, and about 72 hours in *P. malariae*. *P. vivax* and *P. ovale* mainly attack reticulocytes and young erythrocytes, while *P. malariae* tends to attack older cells; *P. falciparum* will parasitize any stage of erythrocyte.**


♀ Anopheles mosquito
Sporozoa
Blood stage
Antimalarial treatment & prophylaxis is directed against schizonts
• Quinine
• Chloroquine
• Mefloquine
• Malarone
• Artesunate
• Proguanil
Trophozoite
RBCs infected with P. falciparum adhere to capillaries in the brain giving the cerebral form
Schizont
Exo-erythrocytic schizogony
Hypnozoites
Merozoites
Merozoites
Taken up by mosquito to complete the cycle
Release of merozoites triggers fever
Hypnozoites are responsible for relapse in P. vivax & P. ovale
Gametocytes
♀ & ♂
Liver stage

Pathology and clinical significance:

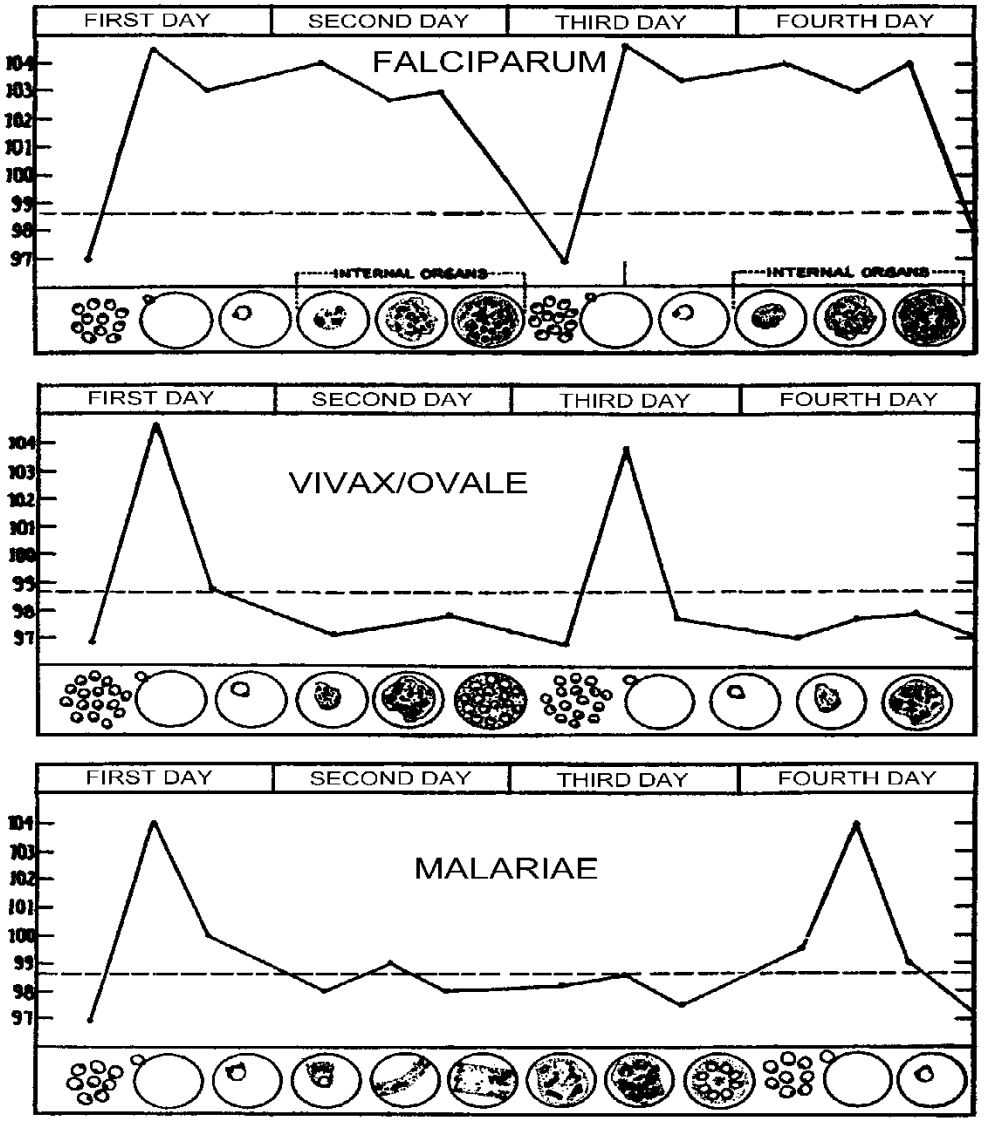
- merozoits invade the blood cells-.
- ***P. malriae, P. vivax,*** **and** ***P. ovale*** cause milder form of the disease, probably because they invade either young or old red cells, but not both.
- This is in contrast to *P. falciparum*, which invades cells of all ages.

Malarial Paroxysm

- **Prodrome** 2-3 days before
  - Malaise, fever,fatigue, muscle pains, nausea, anorexia
  - Can mistake for influenza or gastrointestinal infection
  - Slight fever may worsen just prior to paroxysm
- **Paroxysm**
  - Cold stage - rigors
  - Hot stage – Max temp can reach 40-41^{o} C, splenomegaly easily palpable
  - Sweating stage
  - Lasts 8-12 hours, start between midnight and midday

Malarial Paroxysm

- Periodicity
  - Days 1 and 3 for *P.v.*, *P.o.*, (and *P.f.)* - tertian
  - Usually persistent fever or daily paroxyms for *P.f.*
  - Days 1 and 4 for *P.m.* - quartian



Malaria Paroxysm

- paroxysms associated with synchrony of merozoite release
- between paroxysms temper-ature is normal and patient feels well
- falciparum may not exhibit classic paroxysms (continuous fever)

tertian malaria
quartan malaria

Presentation of P.falciparum

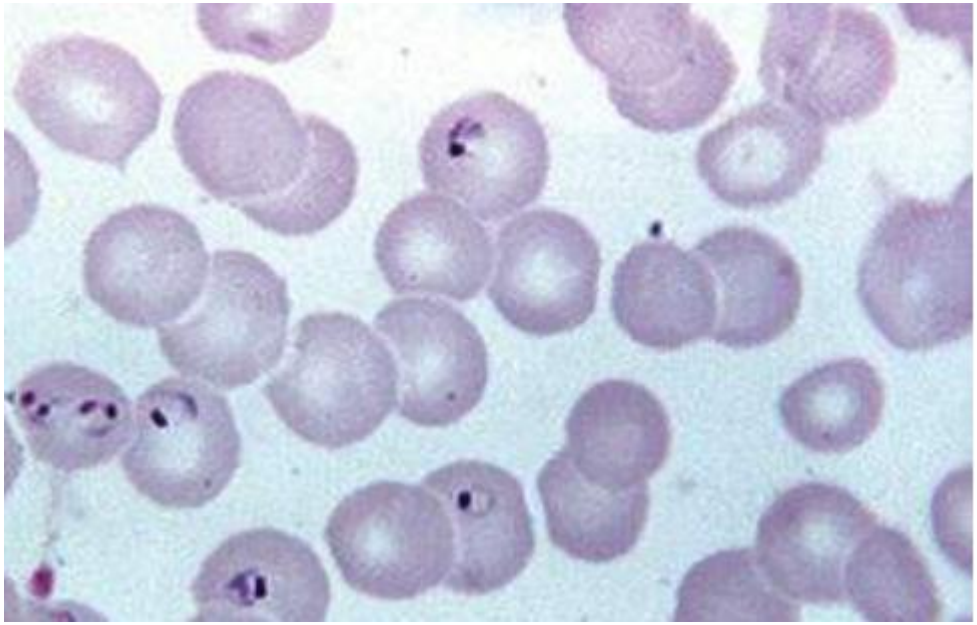
- Fever constant or remittent
- Postural hypotension, jaundice, tender hepatosplenomegaly
- Can progress to severe malaria rapidly in non-immune patients
- Cerebral malaria can occur
- Parasites can sequester in tissues, not detected on peripheral smear

Complications

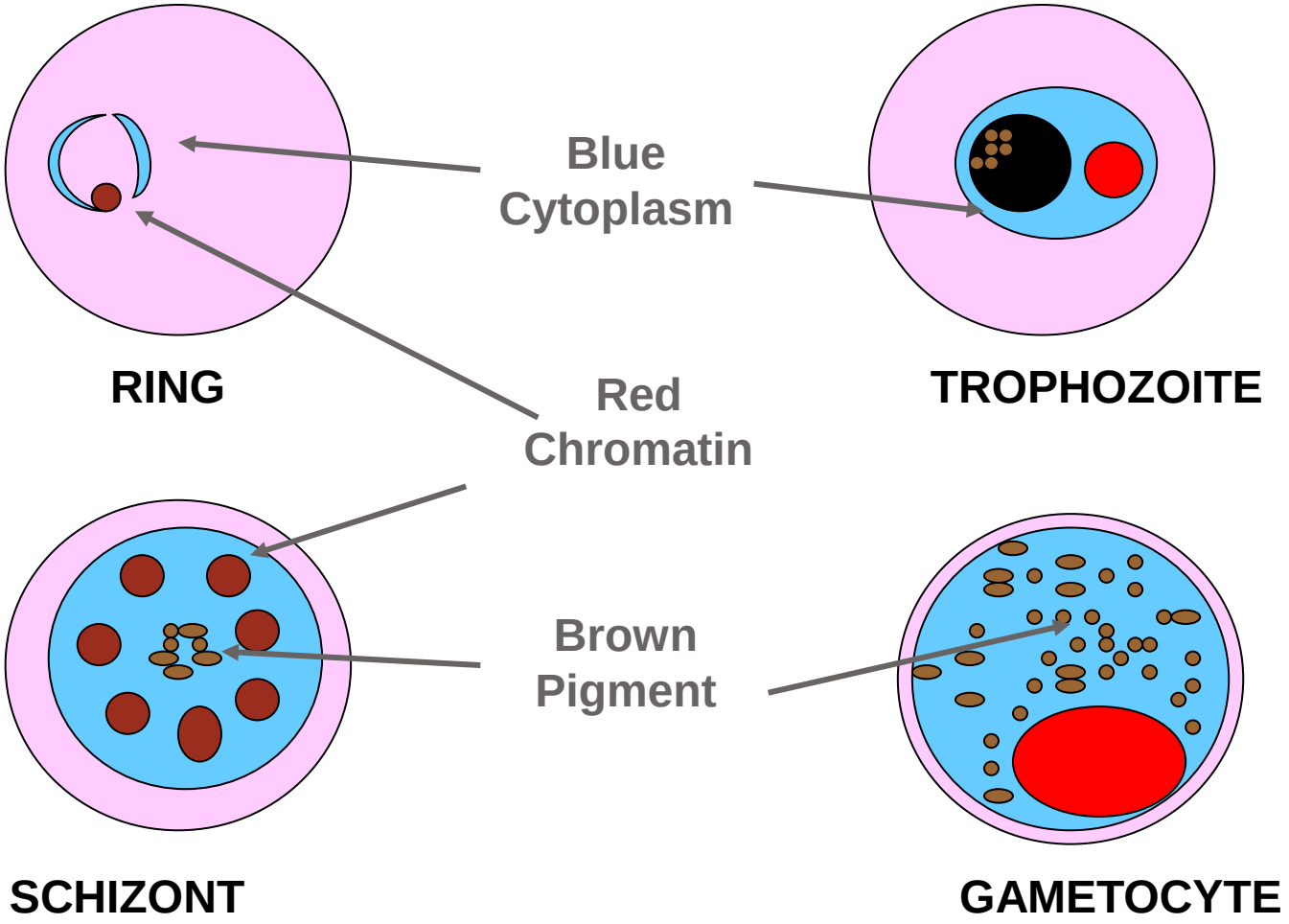
- confusion, seizures
- Low GCS
- Renal impairment
- Acidosis
- Hypoglycaemia
- Pulmonary oedema
- Hb <80
- Spontaneous bleeding/DIC
- Shock
- Haemoglobinuria

dx

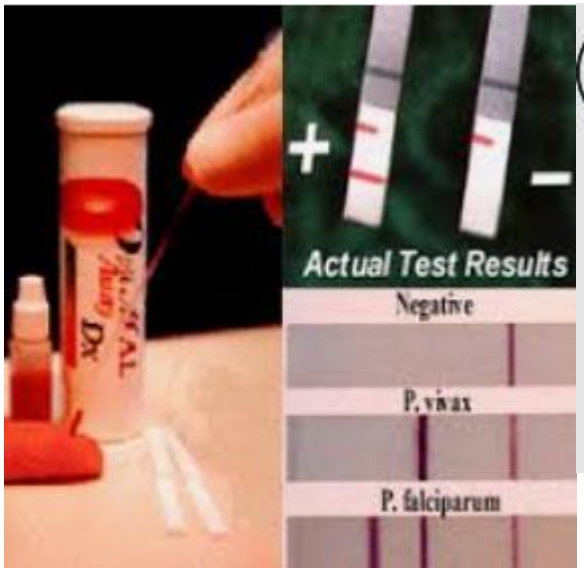
- Giemsa or wright-stained blood smears remain the mainstay of diagnosis
- Thick thin repeated

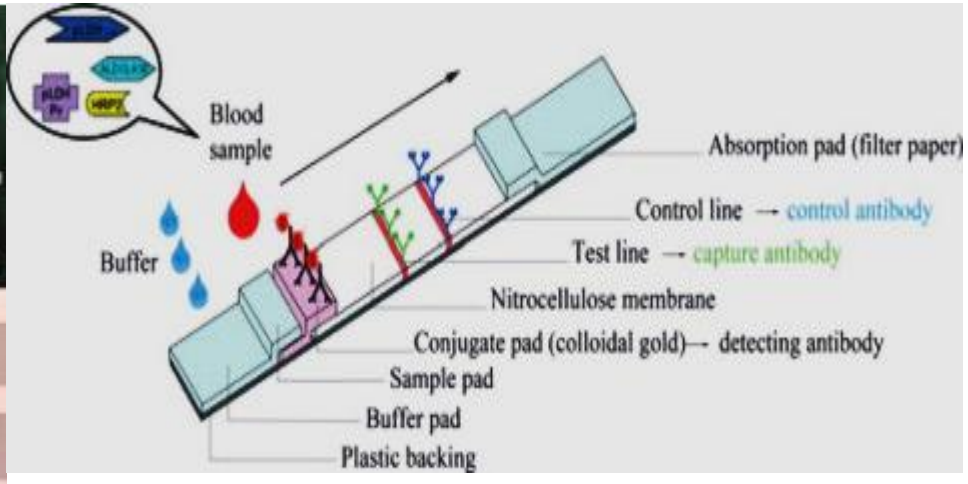


Recognizing Erythrocytic Stages:
Schematic Morphology



- A second means of diagnosis is rapid diagnostic tests to identify circulating
- plasmodial antigens with a simple “dipstick” format





- Other diagnostic findings with uncomplicated malaria include
- anemia, leukocytosis or leukopenia
- thrombocytopenia
- liver function abnormalities

rx

- The first-line drug for non-falciparum malaria from most areas remains chloroquine
- For P vivax or P ovale, eradication of
- erythrocytic parasites with chloroquine should be accompanied by treatment with
- primaquine

- For falciparum or chloroquine resisitant ther e are various WHO recommendations according to regions .

Clinical Setting	Drug Therapy[1]
Chloroquine-sensitive *Plasmodium falciparum* and *Plasmodium malariae* infections	Chloroquine phosphate, 1 g at 0 hours, followed by 500 mg at 6, 24, and 48 hours –or– Chloroquine phosphate, 1 g at 0 hours and 24 hours, then 0.5 g at 48 hours
Plasmodium vivax and *Plasmodium ovale* infections	Chloroquine (as above), then (if G6PD normal) primaquine, 30-mg base daily for 14 days

rx

- P. falciparum
- The treatments of choice for uncomplicated P. falciparum malaria include:
- Oral atovaquone–proguanil
- Oral quinine combined with oral doxycycline or clindamycin
- Combination therapy with an artemisinin derivative
- parenteral artesunate is recommended as first-line treatment for severe P. falciparum malaria, with parenteral quinine as an alternative
- Exchange transfusion may have benefits for treating hyperparasitemic cases of P. falciparum.

- Appropriate care of severe malaria includes maintenance of fluids and electrolytes;
- respiratory and hemodynamic support; and consideration of blood transfusions,
- anticonvulsants, and hemofiltration or hemodialysis

prevention

Drug	Use[2]	Adult Dosage (all oral)[3]
Chloroquine	Areas without resistant *Plasmodium falciparum*	500 mg weekly
Malarone	Areas with multidrug-resistant *P falciparum*	1 tablet (250-mg atovaquone/100-mg proguanil) daily
Mefloquine	Areas with chloroquine-resistant *P falciparum*	250 mg weekly
Doxycycline	Areas with multidrug-resistant *P falciparum*	100 mg daily
Primaquine[4]	Terminal prophylaxis of *Plasmodium vivax* and *Plasmodium ovale* infections; alternative for *P falciparum* prophylaxis	30-mg base daily: for terminal prophylaxis take for 14 days after travel; for chemoprevention begin 1–2 days before travel, take during travel and for 7 days after travel
Tafenoquine[4]	Alternative for *P falciparum* prophylaxis	200 mg once daily for 3 days and then weekly until 1 week after last exposure

toxoplasmosis

- Clinically significant disease typically manifests only in pregnancy or in an
- immunocompromised patient.

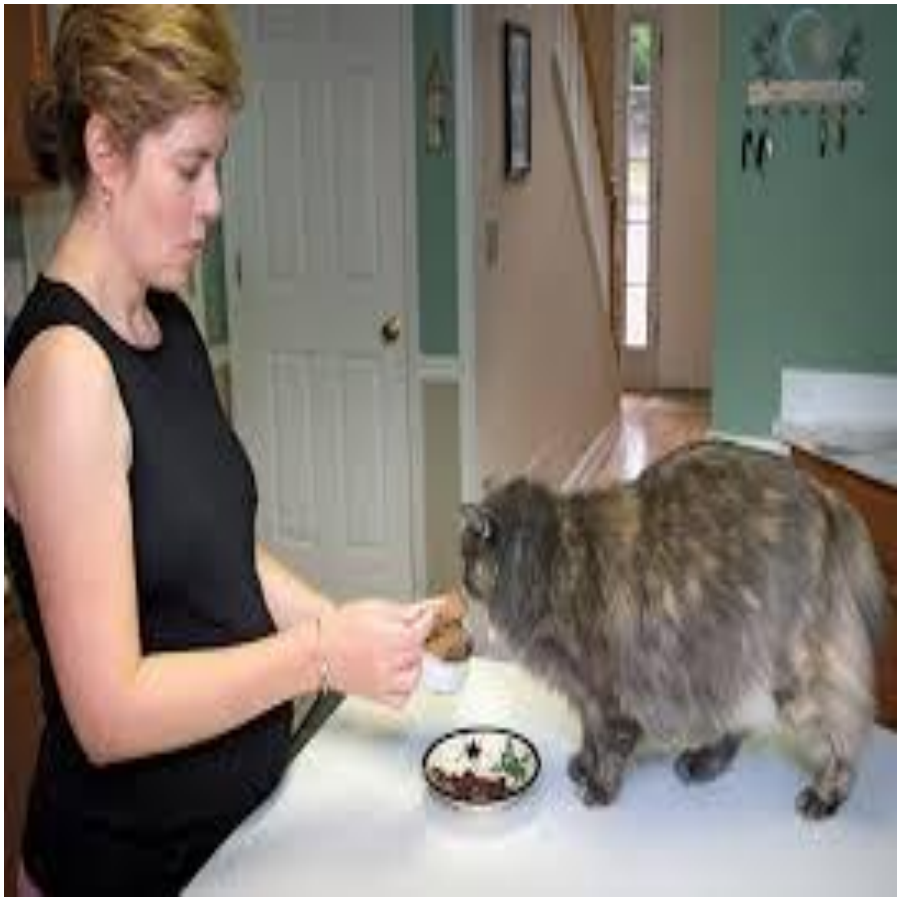
Cliniccal forms

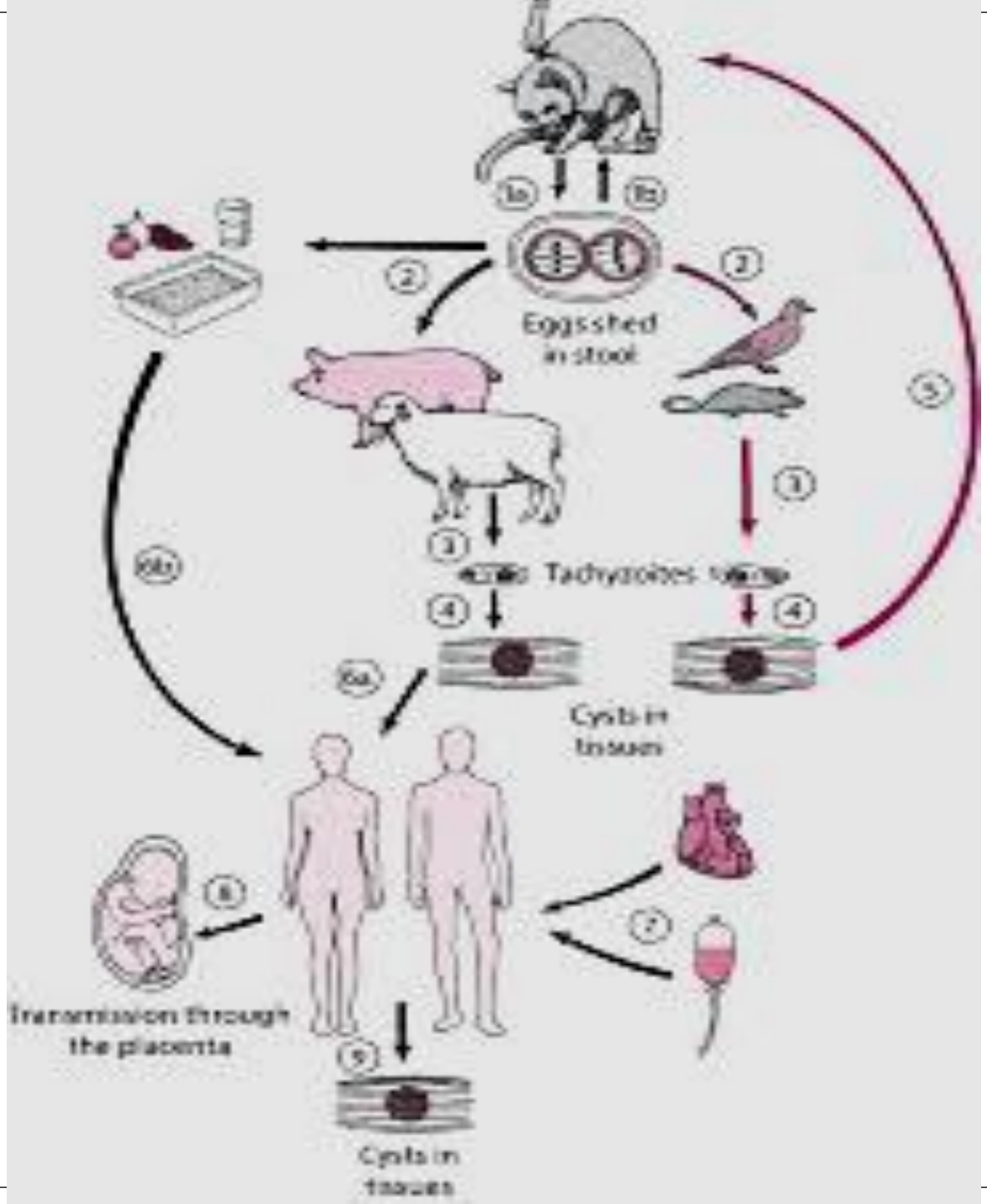
- Acute self-limited infection in immunocompetent
- Acute symptomatic or reactivated latent infection in immunocompromised persons
- Congenital toxoplasmosis (acute primary infection during pregnancy)
- Ocular toxoplasmosis

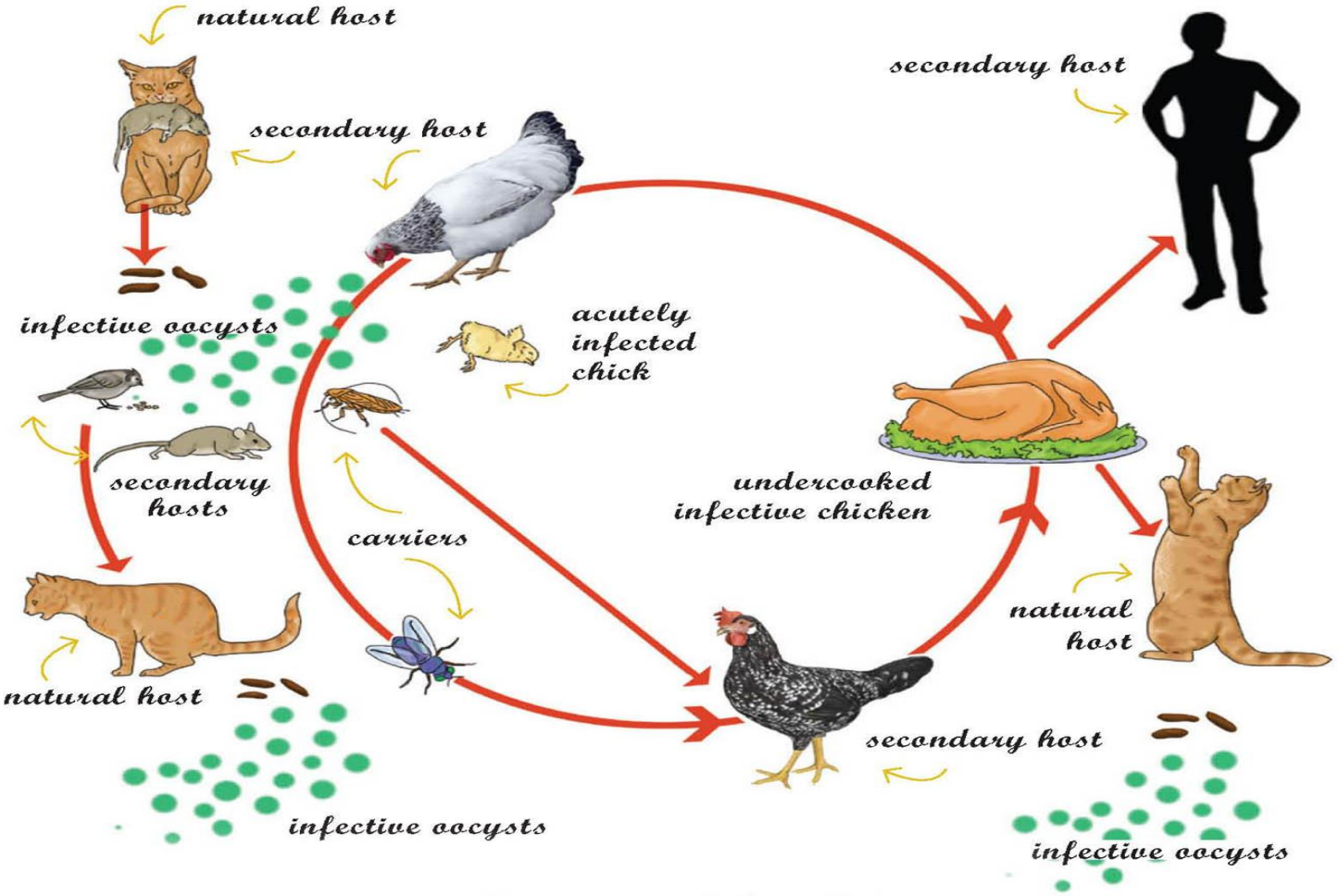
- The earlier fetal infection occurs, the more severe.
- Risk of perinatal death is 5% if infected in 1st trimester

transmission

- Ingestion of raw or undercooked meat, food, or water containing tissue cysts or oocytes that is usually from soil contaminated with feline feces
- Transplacental passage from infected mother to fetus.



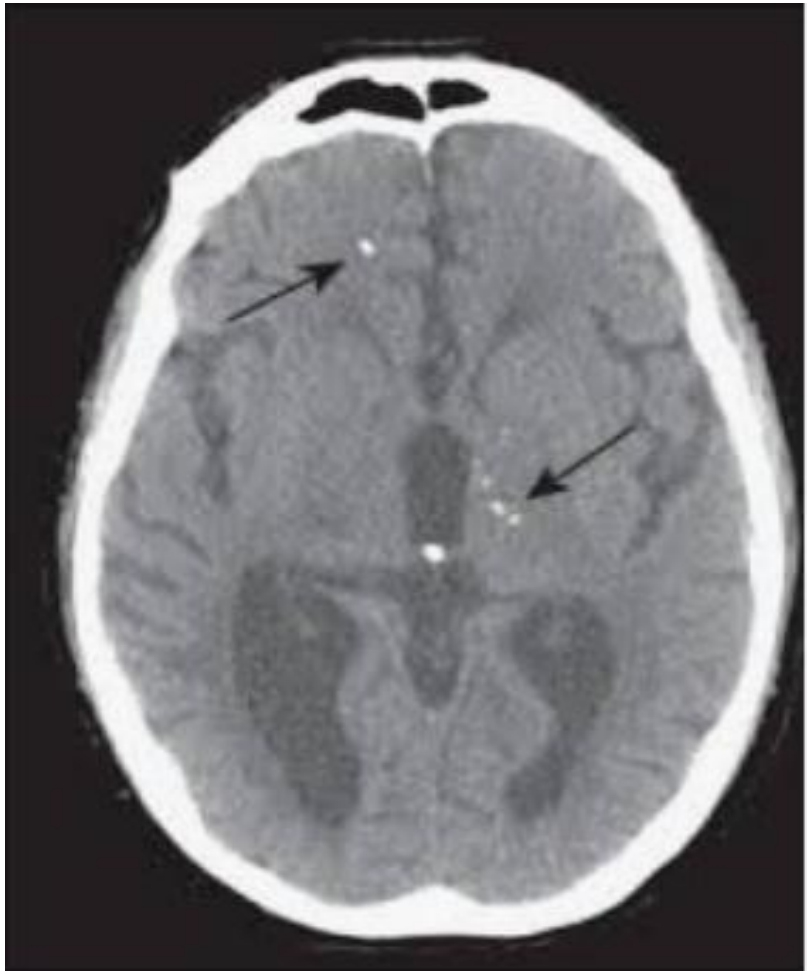

Eggs shed in stool
Tachyzoites
Cysts in tissues
Transmission through the placenta
Cysts in tissues

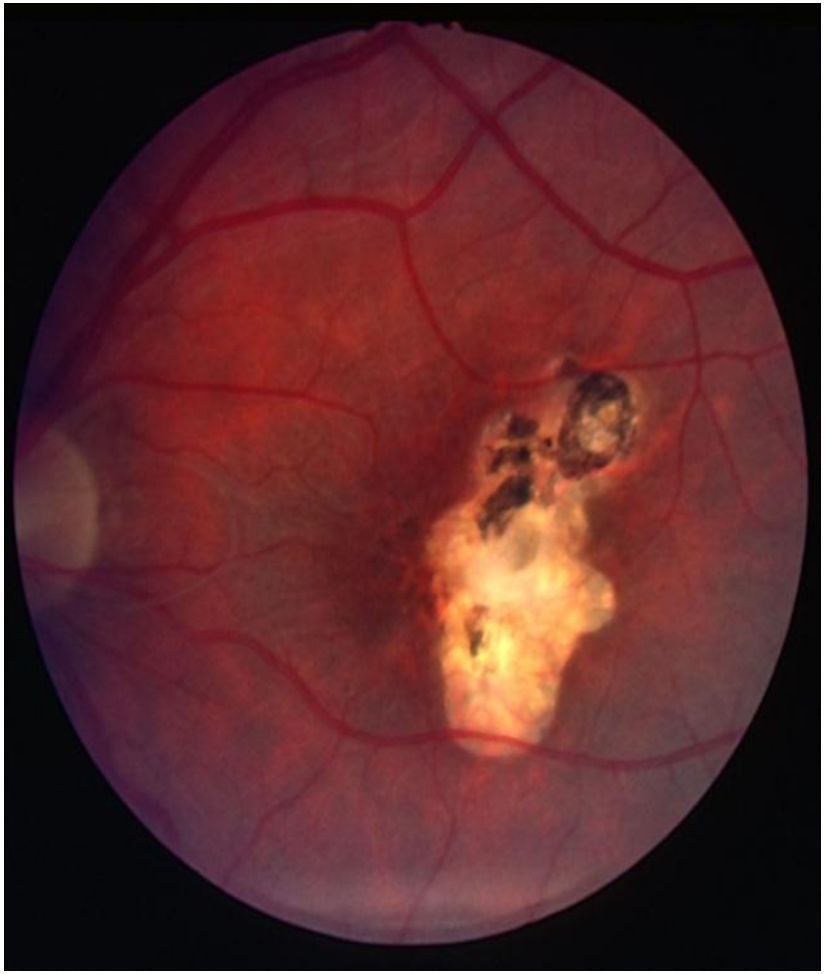

natural host
secondary host
infective oocysts
acutely infected chick
secondary hosts
carriers
natural host
infective oocysts
secondary host
undercooked infective chicken
secondary host
natural host
infective oocysts

RISK FACTORS

- Immunocompromised states, including HIV infection with CD4 cell count<100/μL.
- Primary infection during pregnancy; risk of fetal transmission increases with gestational age at seroconversion.

- self-limiting.
- febrile lymphadenopathy.
- mononucleosis-like illness. Jaundice, rash.
- Chorioretinitis.





prevention

- Avoid eating undercooked meat.
- Avoid drinking unfiltered water.
- Wash produce thoroughly.
- Strict hand hygiene after touching s
- Wear gloves and wash hands after handling raw meat or cat litter.

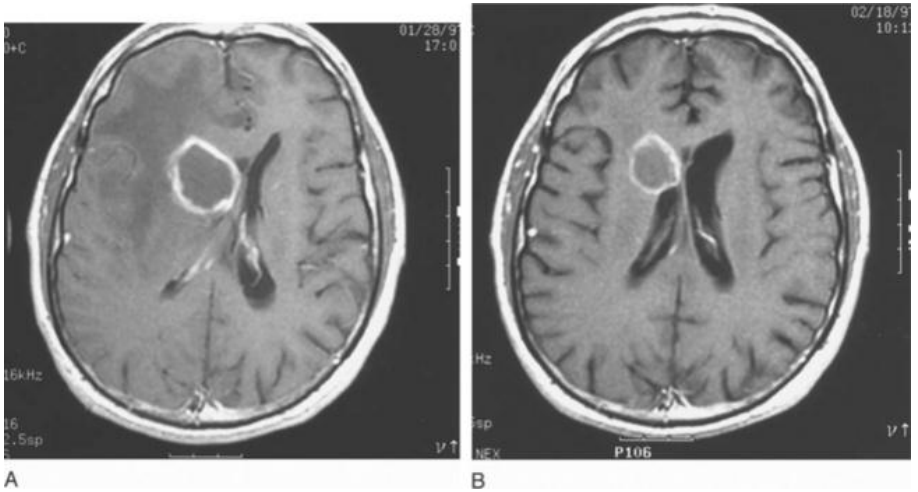
dx

- CBC: atypical lymphocytosis, anemia, thrombocytopenia
- Serology interpretation
- – IgM antibodies appear in the 1st week if acute infection
- – Initial test demonstrates positive IgM and negative IgG, with both tests being positive 2 weeks later.
- – Negative IgG rules out prior infection (IgG persists for life).
- PCR: T. gondii DNA amplification in blood or amniotic fluid; used for diagnosis of fetal infection

- – Routine screening for toxoplasmosis is not recommended in pregnancy.
- Test pregnant women who have mononucleosis-like illness but negative heterophile test for toxoplasmosis.
- Fetal ultrasound is useful for prognosis.

Diagnosis of toxoplasmic encephalitis

- – Serology for IgG
- – Imaging: MRI is more sensitive than CT scan to identify characteristic ring enhancing lesions.



- Lymph node biopsy
- Brain biopsy in CNS disease
- Placental isolation of Toxoplasma is diagnostic.

rx

- pyrimethamine and sulfadiazine
- Trimethoprim-sulfamethoxazole
- Spiramycin in pregnancy

- =