Microbiology Revision

اللهم اني أسألك فهم النبيين وحفظ المرسلين والملائكة المقربين اللهم اجعل ألسنتنا عامرة بذكرك، وقلوبنا بخشيتك، وأسرارنا بطاعتك، انك على كل شيء قدير، وحسبنا الله ونعم الوكيل

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Intestinal Helminths

1-Enterobius vermicularis (PIN WORM)

(Common names :Pin worm)

- Found all over the world but more common in temperate regions and in Saudi Arabia.

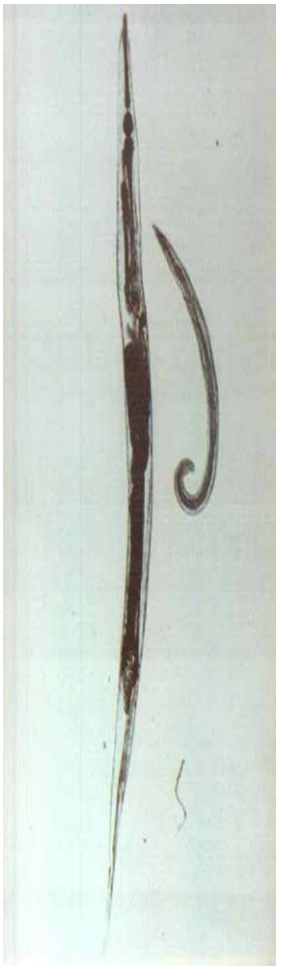
- Children are more often involved than adults , it tends to occur in groups living together such as families , army camps or nursery.

-- Adult worms are mainly located in lumen of cecum and the female migrate to rectum to deposits her eggs on the anus and perianal skin.

-- Adult worm can be seen by naked eye as white thread ± 1cm.

Male is smaller than female ± 0.5cm, with coiled end.

- Known to cause autoinfection



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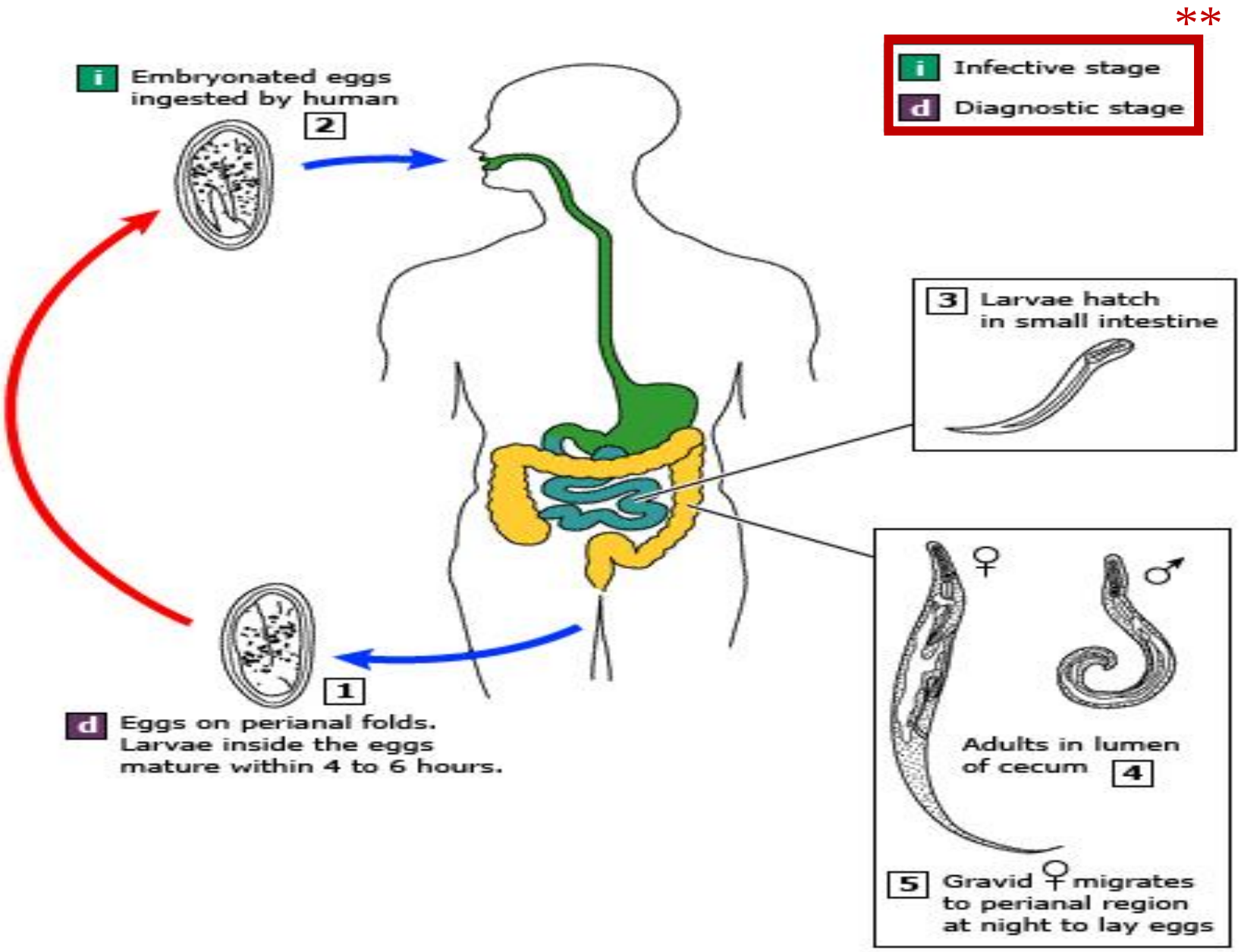

i Infective stage
d Diagnostic stage
i Embryonated eggs ingested by human
2
3 Larvae hatch in small intestine
♀
♂
Adults in lumen of cecum
4
5 Gravid ♀ migrates to perianal region at night to lay eggs
1
d Eggs on perianal folds. Larvae inside the eggs mature within 4 to 6 hours.

1-Enterobius vermicularis (PIN WORM)

DIAGNOSIS :

- Unlike other intestinal Nematodes, the eggs are not usually found in feces .The best method is to look for them around the anus by taking an anal swab or by using ***CELLULOSE ADHESIVE TAPE***, the examination should be done before defecation or bathing.

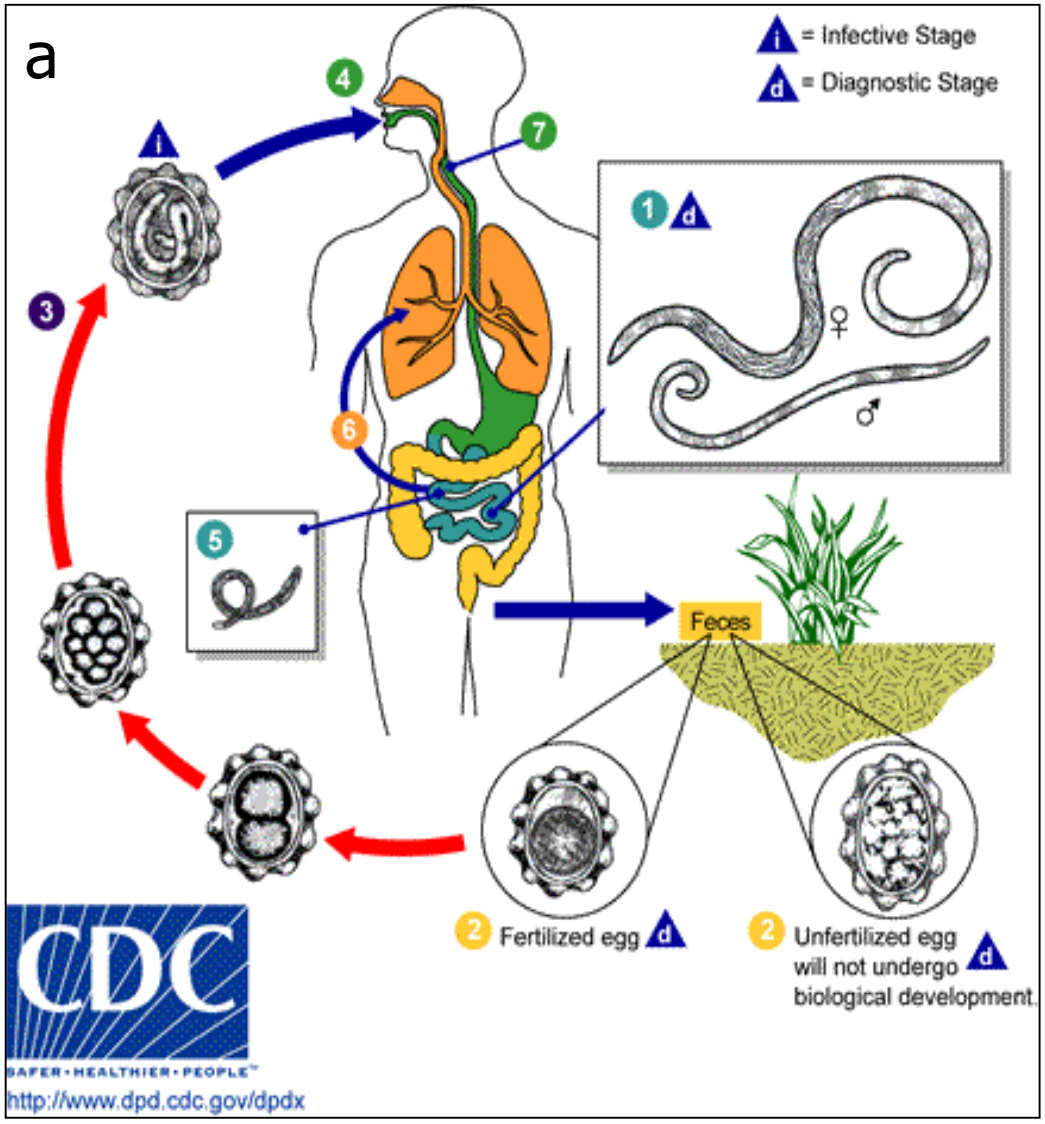
Treatment

- Albandazole , Mebendazole

N.B for whole family

Known to cause autoinfection

2-Ascaris lumbricoids (ROUND WORM)



Infective stage:
emberyonated egg

Diagnostic stage:
fertilized egg

Life cycle of Ascais Lumbricoides

It infect the human when man ingest an **emberyonated egg** contaminated with food or water, then the Larva hatch from the emberyonated egg and penetrate the wall of the **duodenum** and enter the blood stream to the heart ,liver and enter the **pulmonary circulation** and stay in the **alveoli** ,where it grow and molts for three weeks then Larva passes from respiratory system to be **coughed up ,swallowed** ,returned to the small intestine where it mature to adults male &female ,fertilization take place producing**200.000 fertilized (diagnostic stage)** eggs per day, which pass in stool and has to stay in **soil** for2 to4weeks to become **emberyonated infective stage eggs**.

2-Ascaris lumbricoids (ROUND WORM)

Diagnosis:

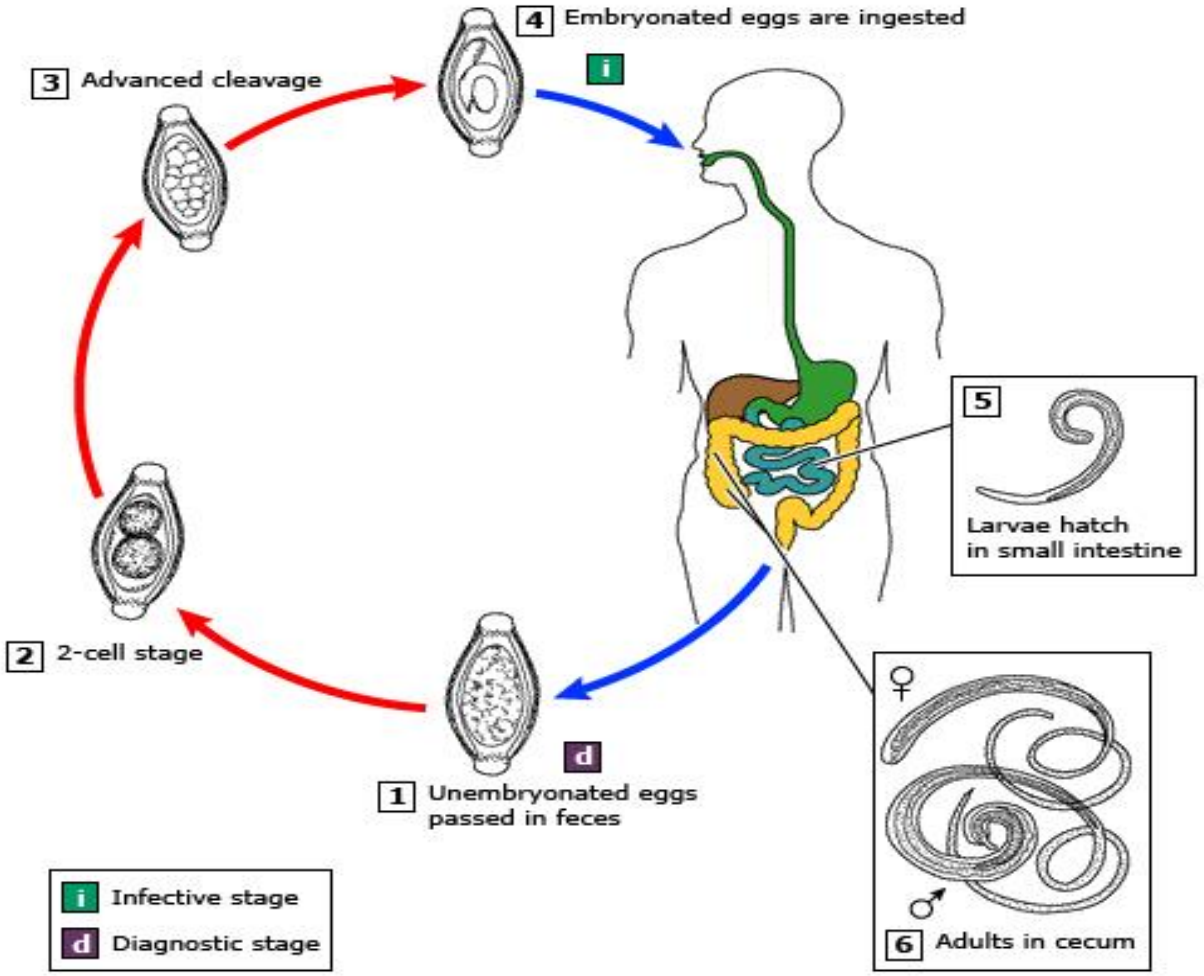
-eggs (fertilized) in stool.

-larvae in sputum.

-adult may pass with stool.

Treatment: Albendazole , Mebendazole

3- Trichuris trichiura (WHIP WORM)



Infective stage:
Emberyonated egg

Diagnostic stage:
fertilized egg

3- Trichuris trichiura (WHIP WORM)

CLINICAL MANIFESTATIONS :

light infection : asymptomatic

heavy infection :abdominal pain ,bloody diarrhea.Colitis & **Rectal prolapse** in children is a common complication.

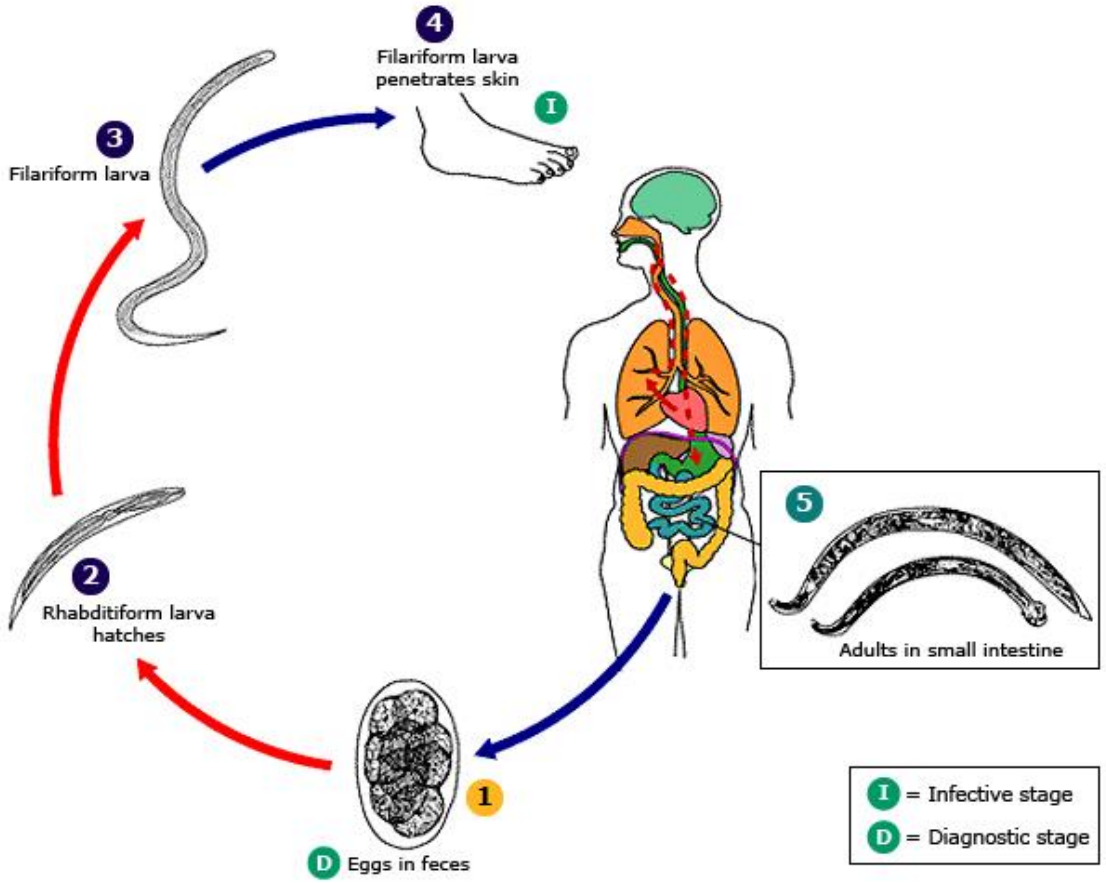
Diagnosis: egg in stool characterized by its barrel shape with mucoid plugs at each pole .

Treatment :Albendazole.

4- *Ancylostoma dudenale &Necator americanus*

(HOOK WORM)

cause sever iron deficiency anemia



3- *Ancylostoma dudenale &Necator americanus*

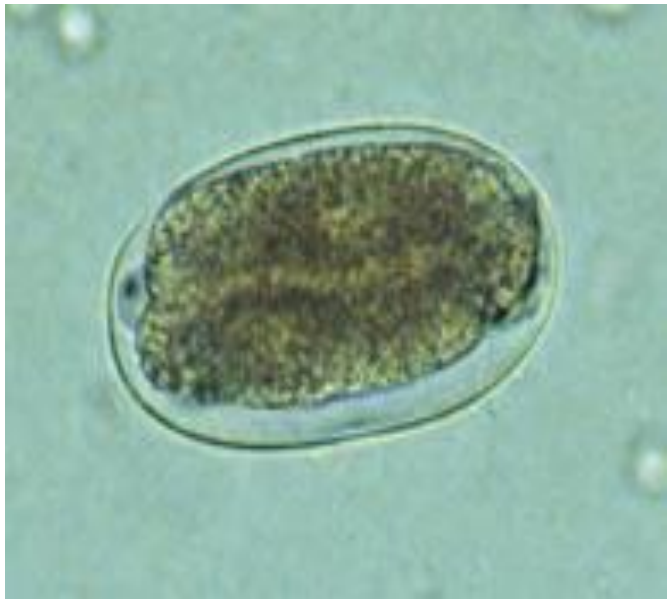
(HOOK WORM)

Diagnosis:

Stool examination

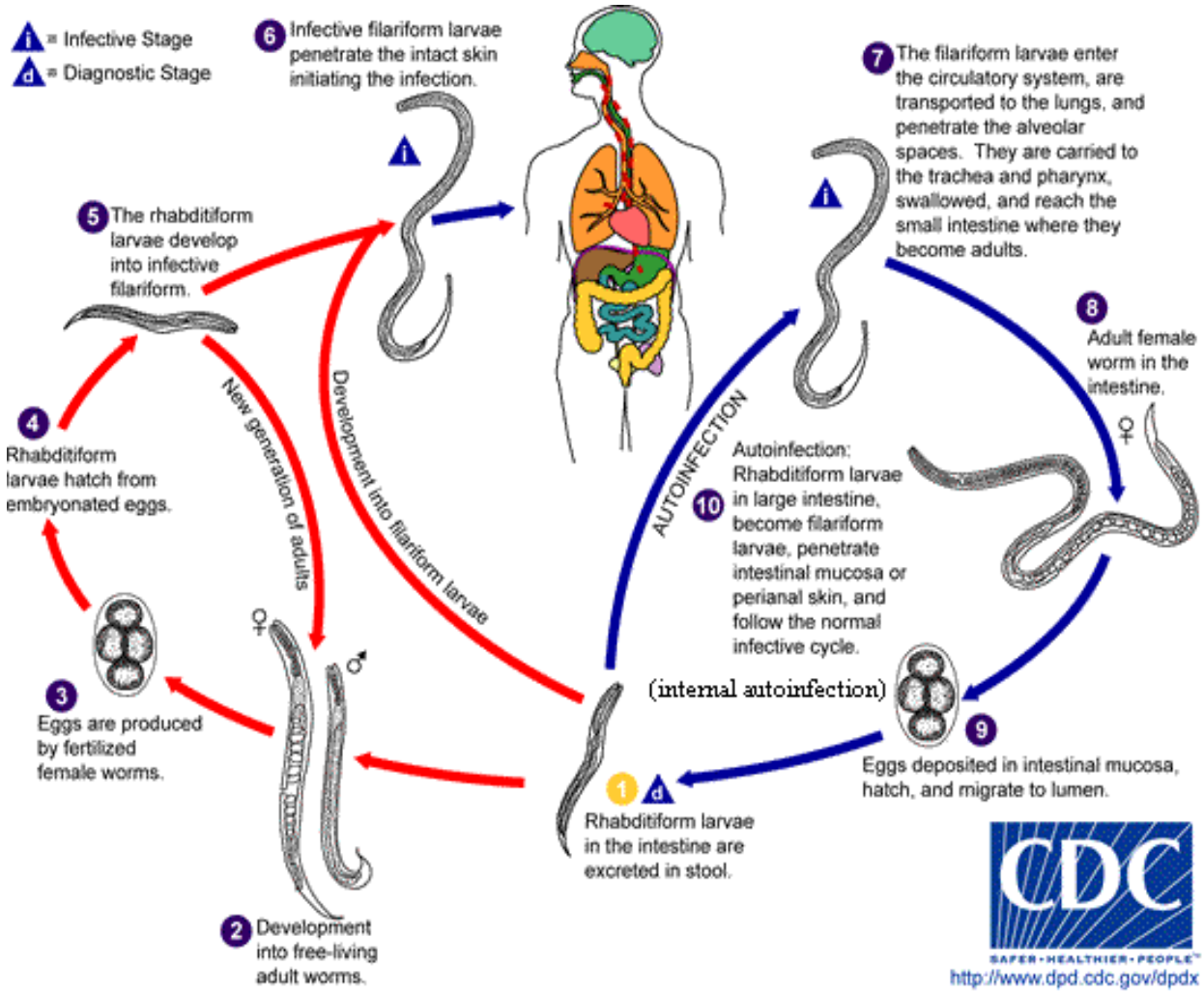
-Eggs in stools

-occult blood (+) **Eosinophilia : as well in any parasitic infection**



Treatment: Albendazol, Mebendazole

5-Strongyloides stercoralis

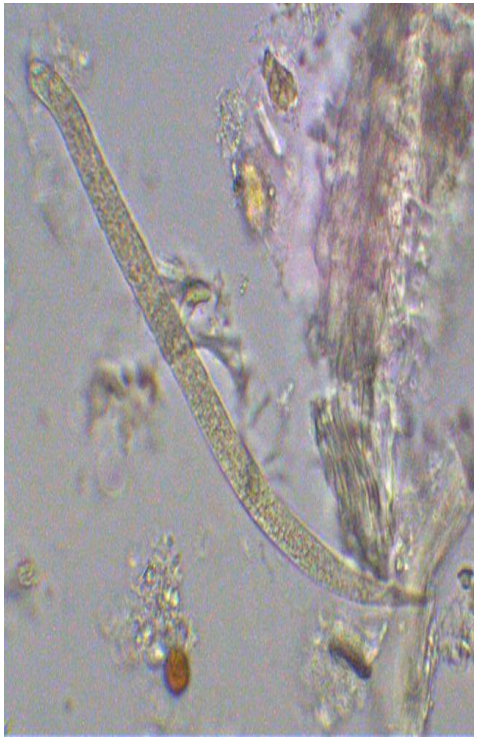


Known to cause Autoinfection

Diagnostic stage: Larva

5-Strongyloides stercoralis

Diagnosis:



rhabditiform larvae diagnostic stage in:

-Stool examination

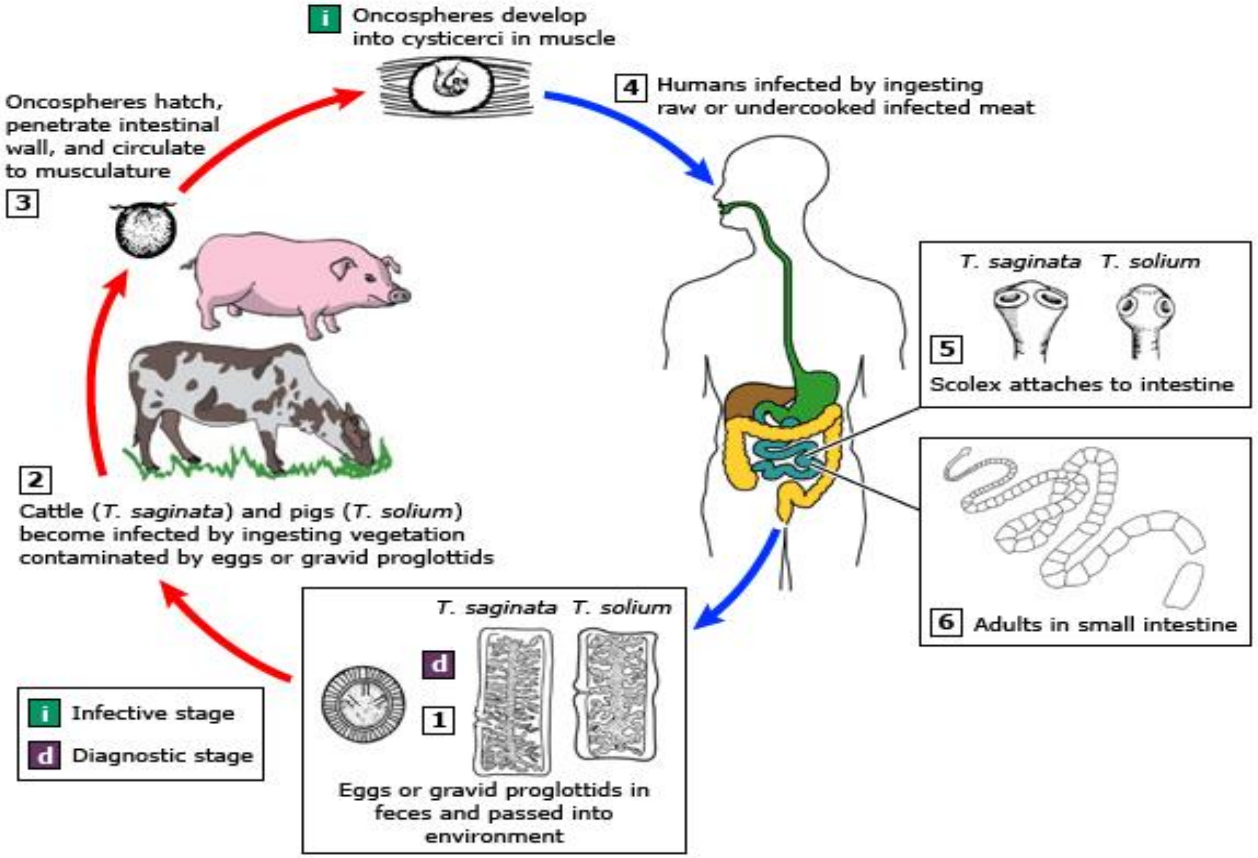
-Aspiration of duodenojejunal fluid. In disseminated strongyloidiasis, filariform larvae can be found in stool, sputum, bronchoalveolar lavage fluid, pleural fluid, peritoneal fluid.

Treatment : Albandazole, Mebendazole

Very important known to have auto infection

Taeniasis — There are two main species of *Taenia* for which humans are the only defenitive host

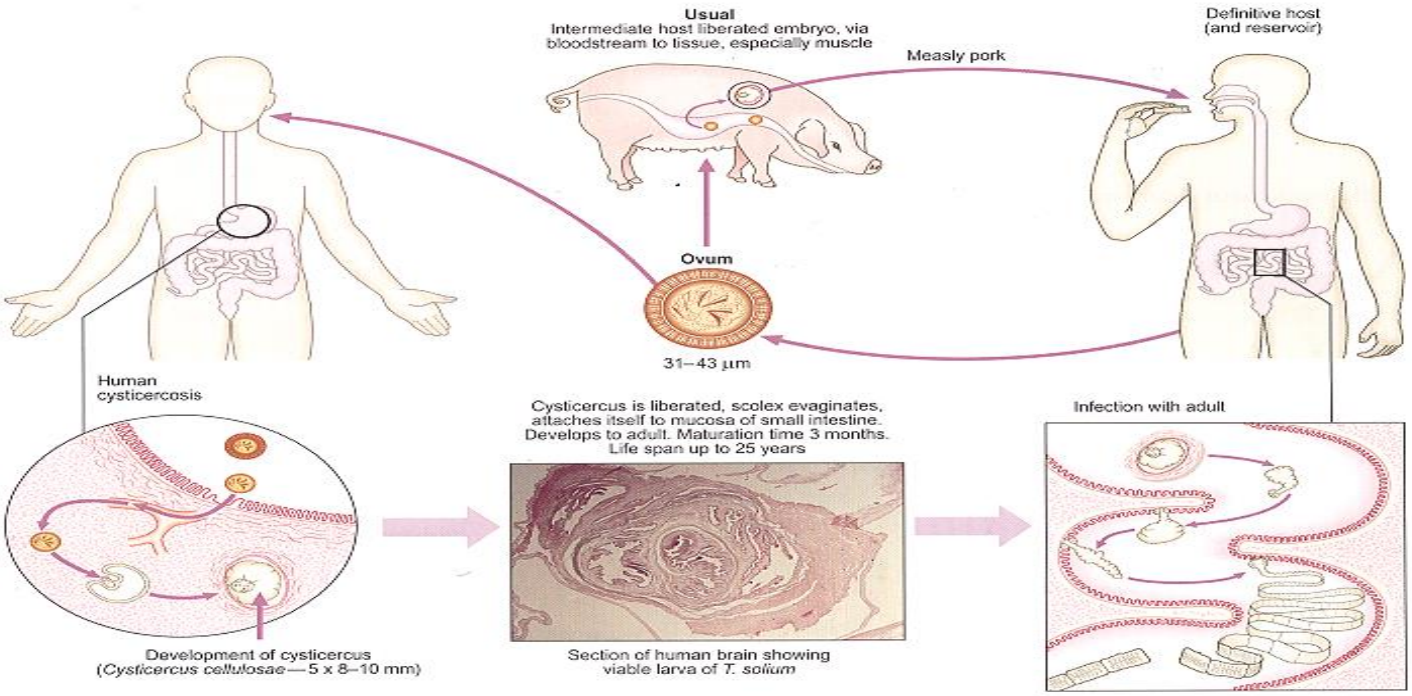
T. saginata, T. solium.



Cestode (tape) worms

Taenia solium (pork tape worm)

Life cycle



Pathology and Clinical features

Infection by larvae (cysticercosis). Cysticerci, generally multiple, may occur in any site but are more frequent in the brain and muscle. They excite reaction in the area, especially when they die, which manifests as inflammation, fibrosis and later some calcification. This leads to focal CNS syndromes, especially epilepsy.

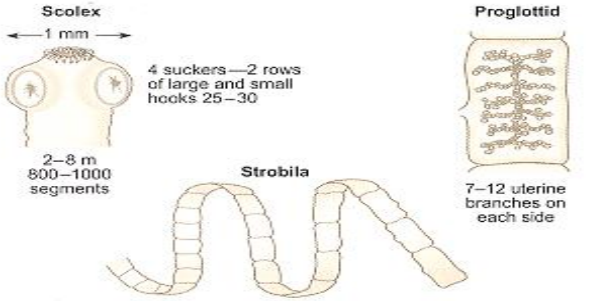
Infection with adults. Often there can be no pathology, but there might be mild irritation of intestinal mucosa.

Laboratory diagnosis

Eosinophilia.

Larval infections. There are several methods, including histological examination of biopsy material, serology (IFAT, ELISA, EITB) and radiology (CT or MRI scan of the brain, X-ray of the thigh muscles).

Pure infection with the adult. Gravid segments, ova and scolex can be found in faeces. The uterine branches of the mature segments can be demonstrated by injection of Indian ink through the uterine pore.



Distribution

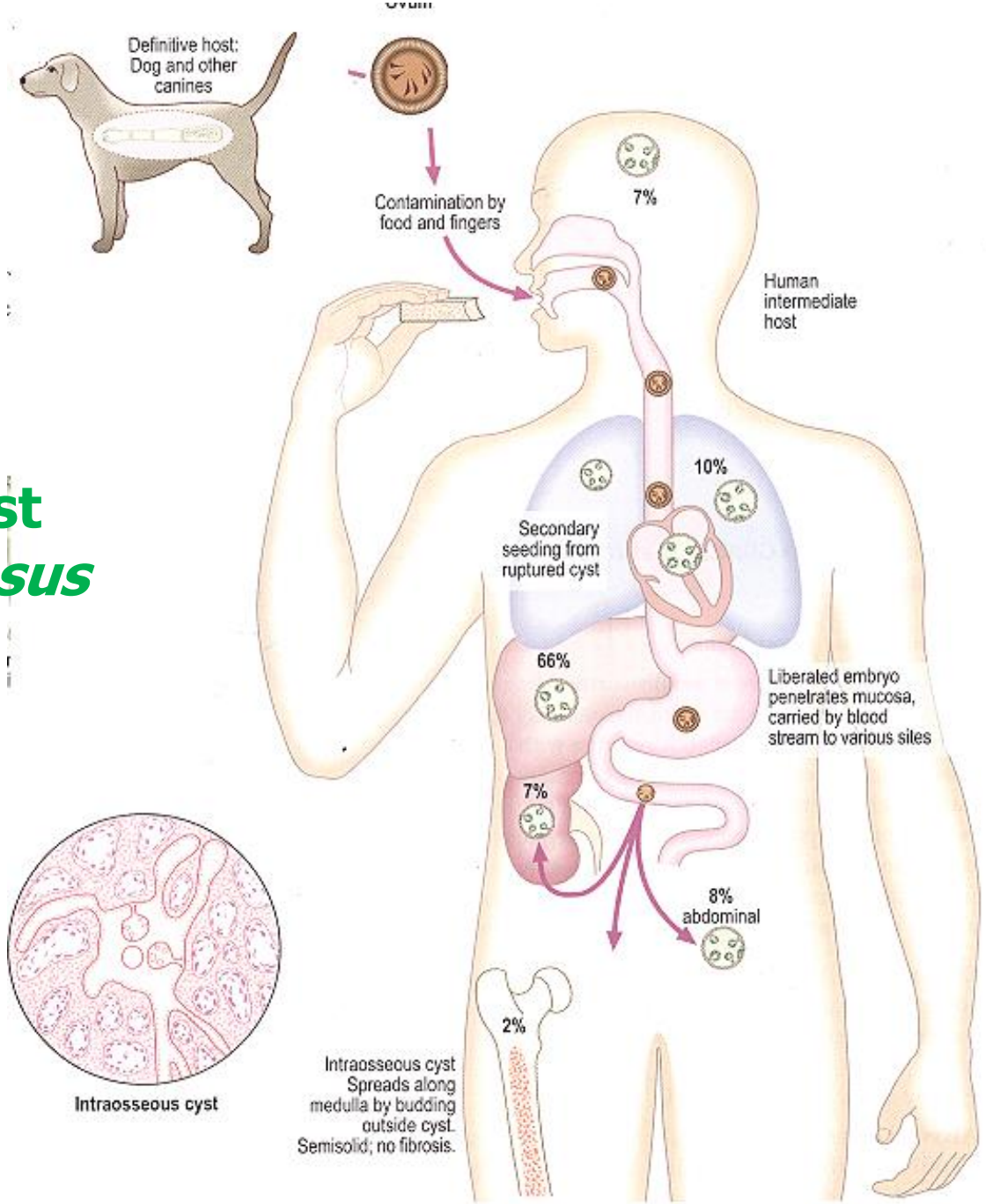
5 million people infected worldwide. *Taenia solium* is endemic in pig-rearing areas of the world where hygiene and animal husbandry are poor.

Life cycle of *Taenia solium*

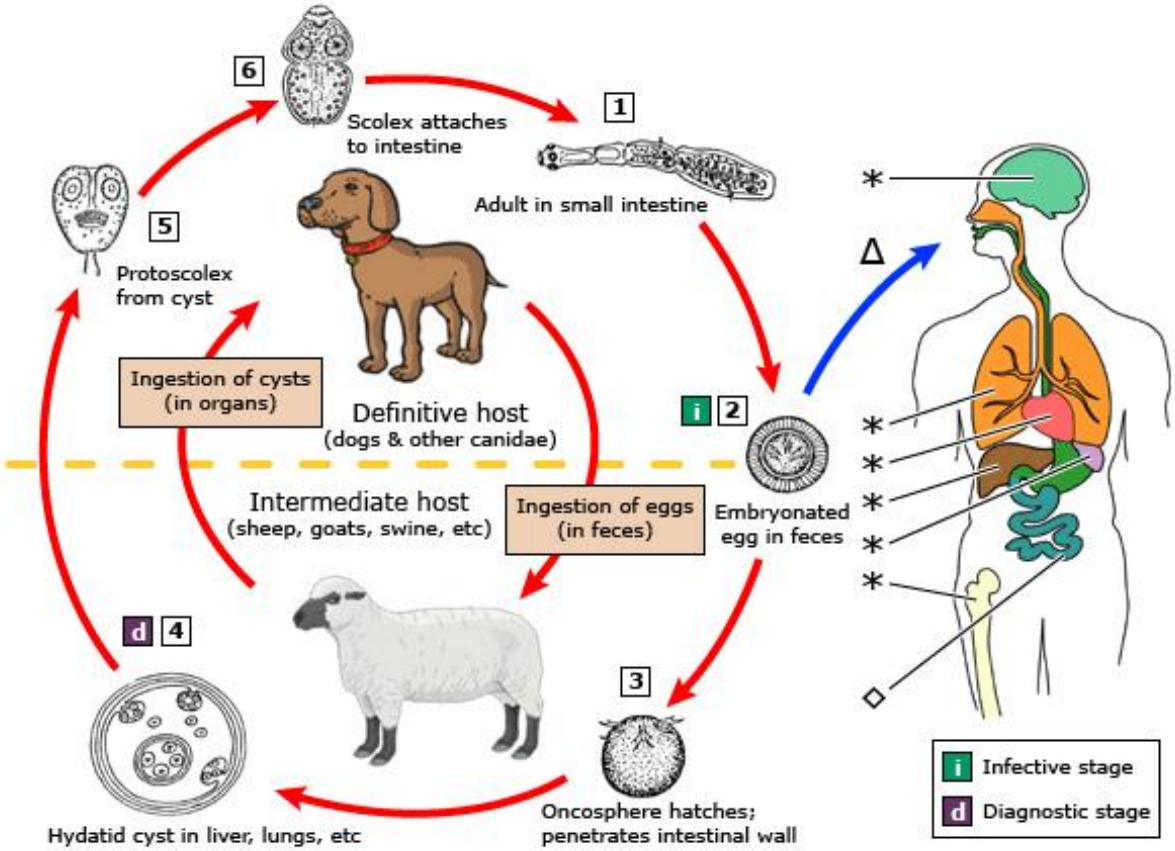
Pathology and clinical feature of cysticercosis

Infection by ingestion the egg of Taenia Solium then the larvae will hatch and cause (cysticercosis). Cysticercosis generally multiple, may occur in any site but are more frequent in the brain and muscle. They excite reaction in the area ,as inflamation ,fibrosis and later some calcification. This leads to focal CNS syndromes especially epilipsy.

Location of hydatid cyst
Echinococcus granulosus

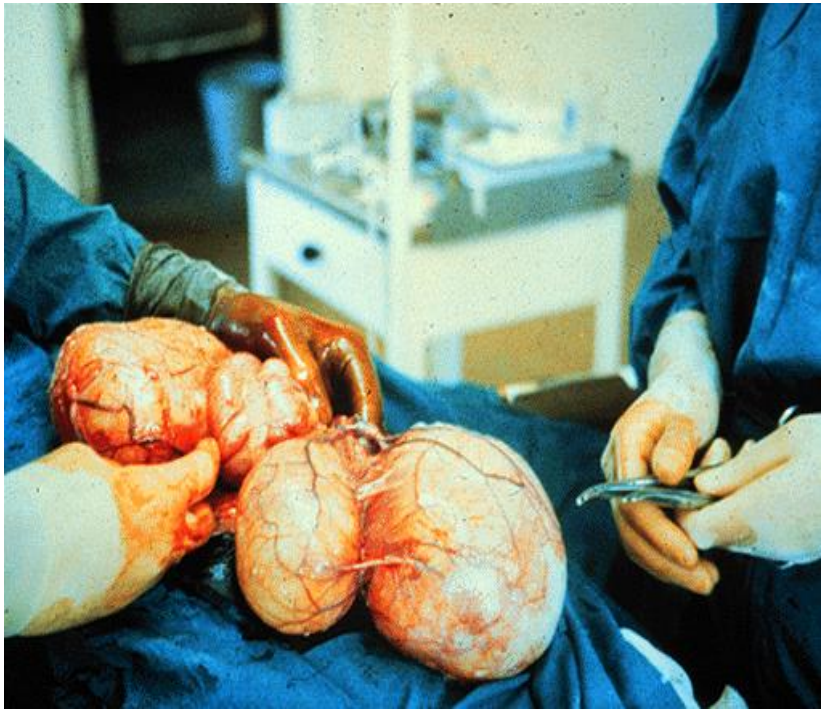


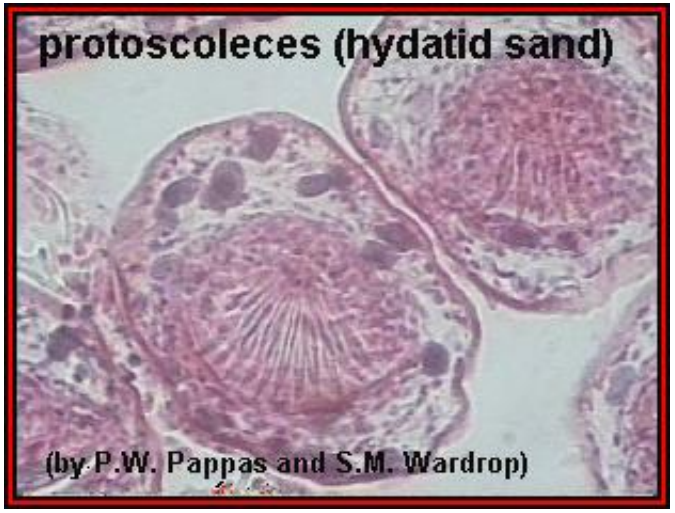
life cycle — The life cycle of echinococcus includes a definitive host (usually dog) and an intermediate host (such as sheep, goats, camels, cattle, and swine) . Humans are incidental hosts; they do not play a role in the transmission cycle. *E. granulosus* a dult tapeworms are usually found in dogs .



Location of hydatid cyst of Echinococcus granulosus

Mainly in the liver lung ,brain,bone, heart.





Treatment of Tapeworms

Intestinal stages: Praziquantel

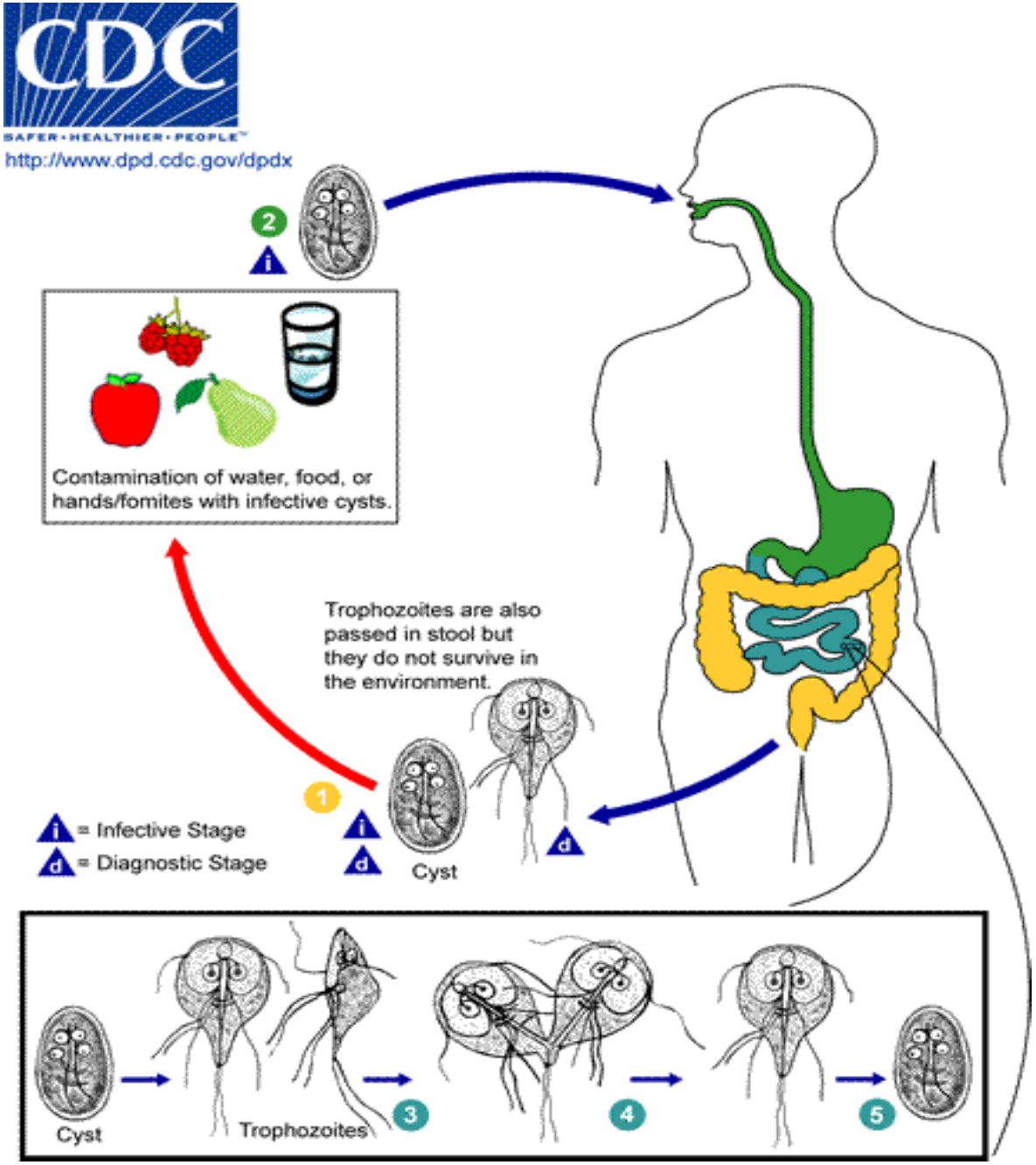
Tissue stages (Hydatid , cysticersosis):

Depends on clinical condition : Surgical and/or Albendazole

Intestinal Protozoa

Giardia lamblia :

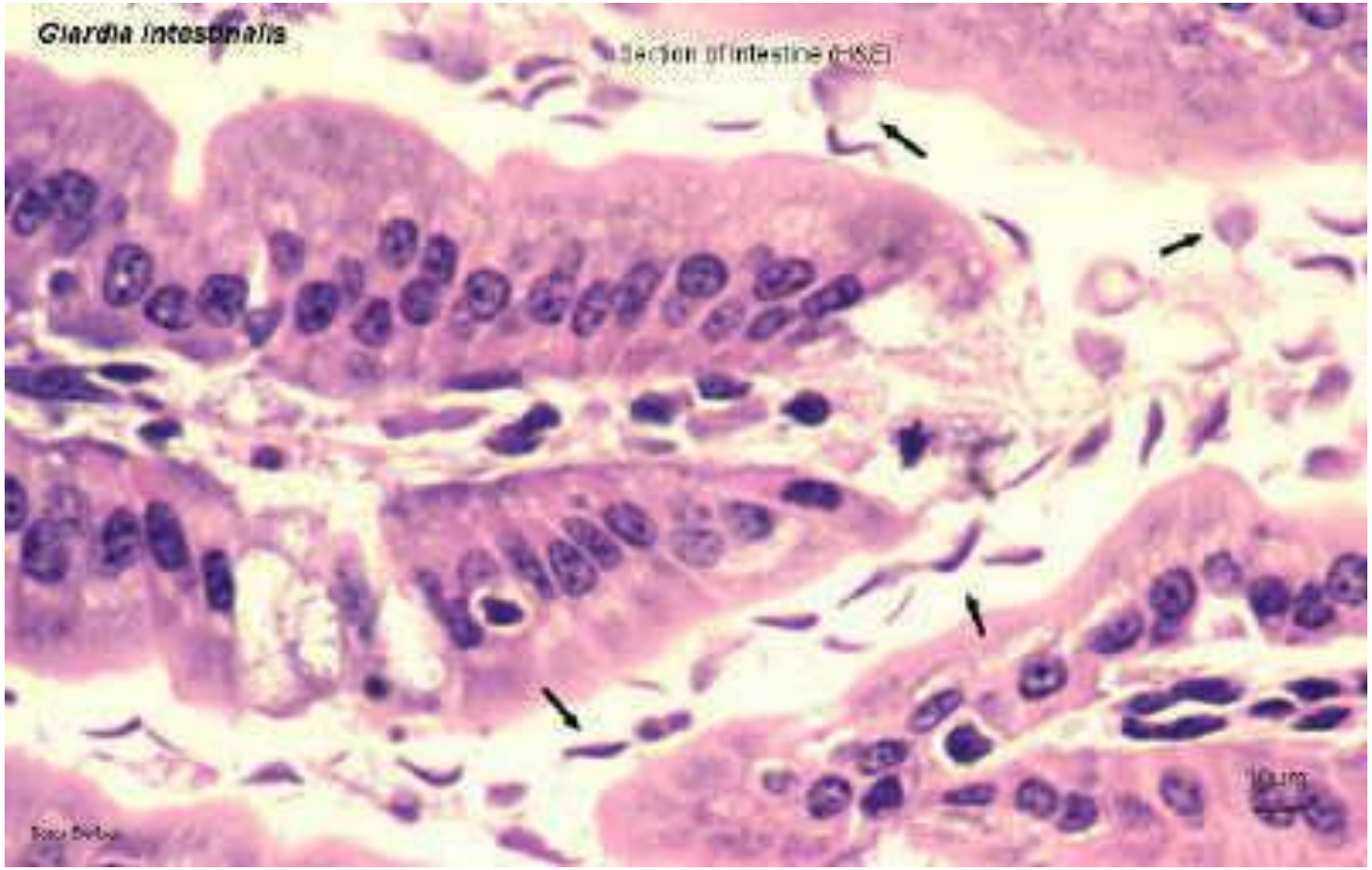
Life cycle



Infective stage:
cyst

Diagnostic stage:
cyst & trophozoites

Giardia trophozoites in duodenum tissue section



Giardiasis: diagnosis& treatment

Diagnosis :

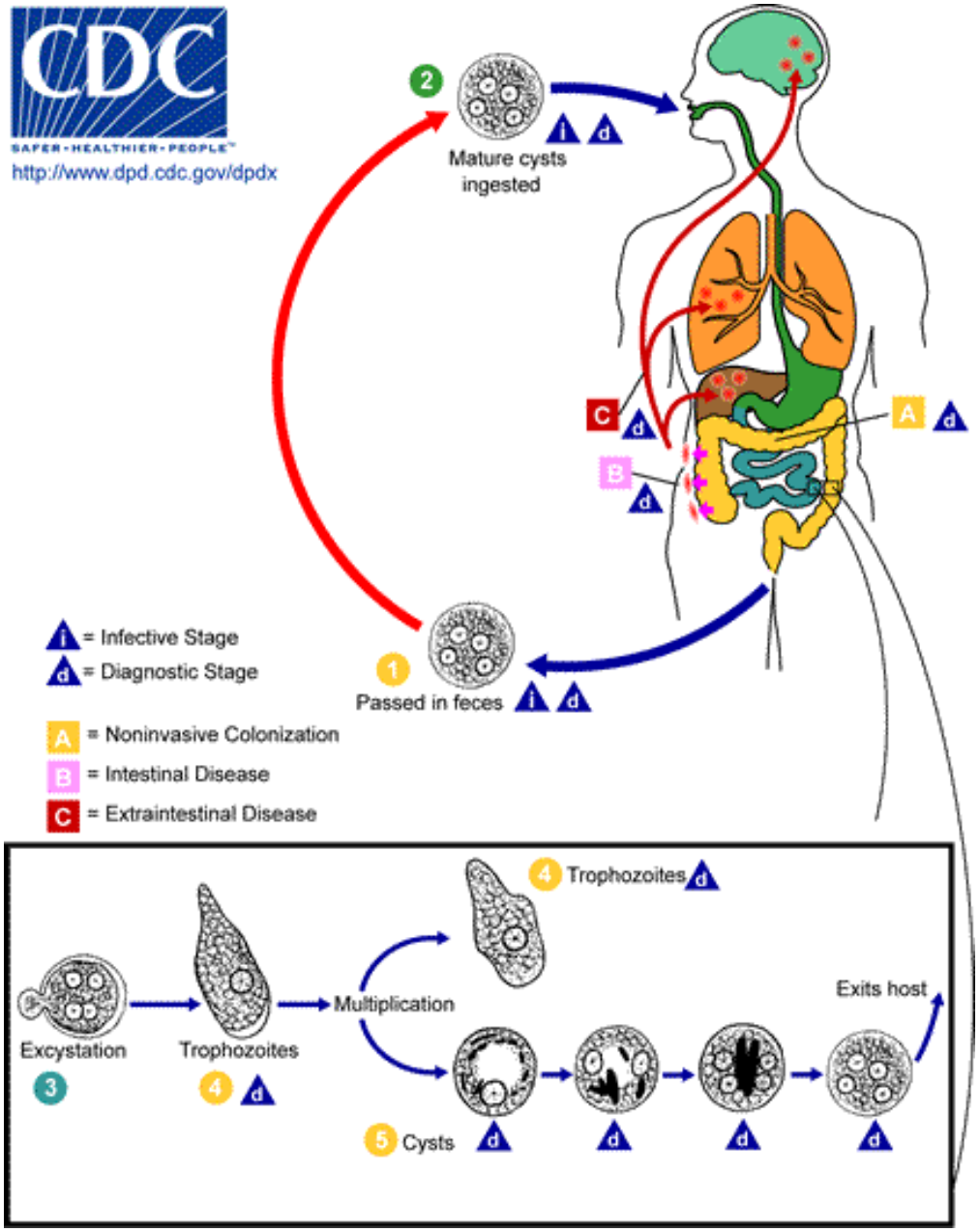
Stools examination :Microscopy for cysts or trophozoits

Antigen detection assays : a number of immunoassays using antibodies against cyst or trophozoite antigens have been developed for stool analysis.

Examination of duodenal contents : look for trophozoites.

Tteatment :

Drug of choice is Metronidazole



Entamoeba histolytica

Infective stage: cyst

Diagnostic stage: cyst

500 million people are infected. 100,000 deaths per year. Worldwide distribution. It is a waterborne infection.

There are 6 species of *Entamoeba:*

E.histolytica

E.dispar

E.hartmanni

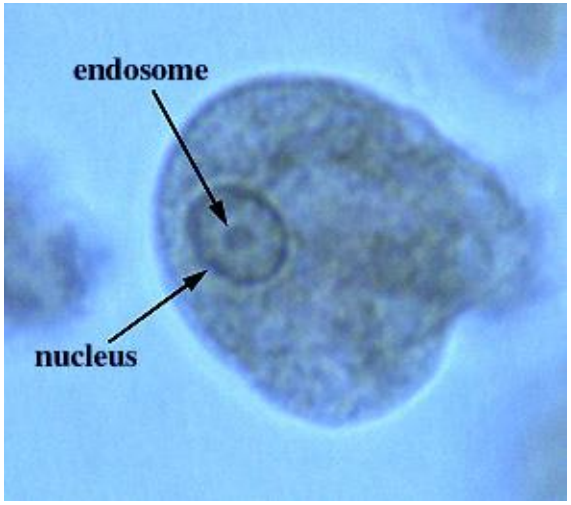
E.coli

E.gingivalis

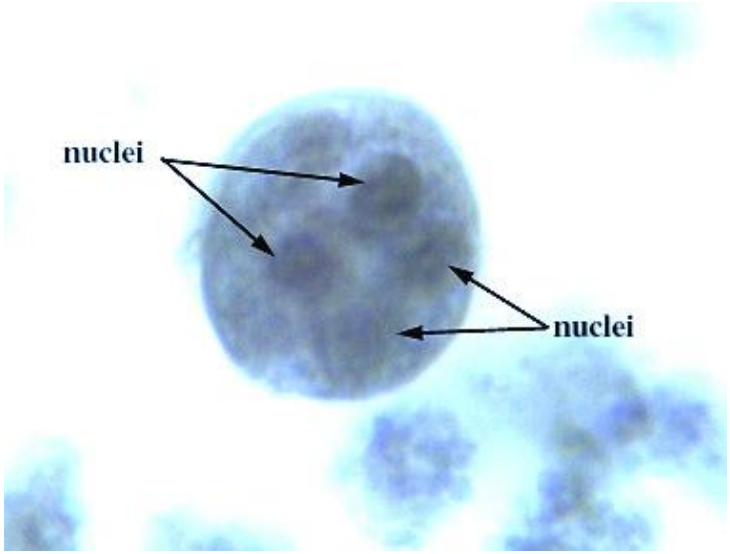
E.polecki

Entamoeba histolytica

Trophozoite: vegetative stage, must encyst to survive in the environment. It is a fragile structure.



Cyst: infective stage. Resist to the harsh conditions of the environment.



Entamoeba histolytica

PATHOLOGY

Intsetinal amoebiasis :

Remarkable and unique ability to produce enzymes that lyses host tissue.

Lesions are found mainly in the colon.

They may heal Or may cause complications :

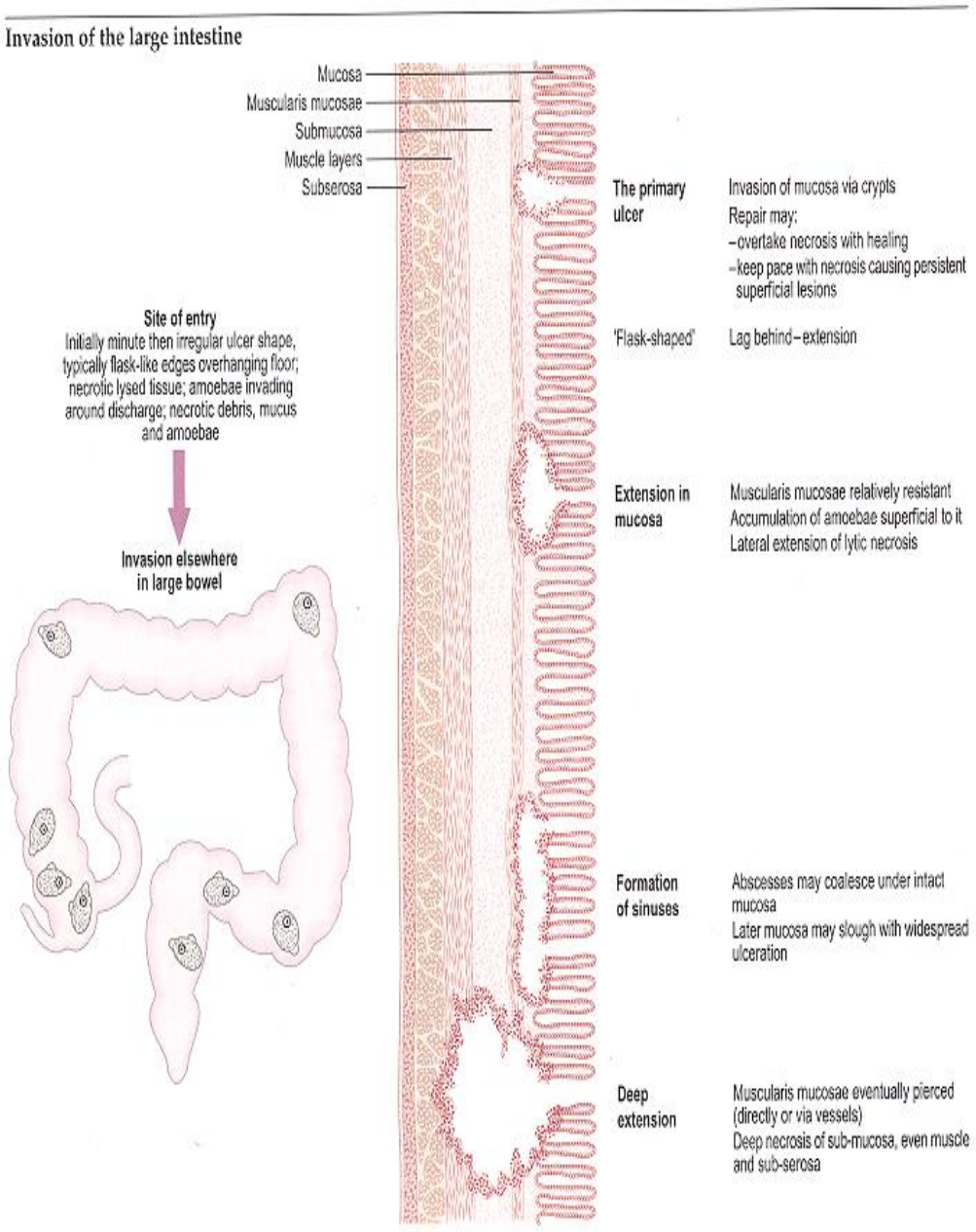
- **Perforation of the colon.**
- **Amoeboma : Granulomatous mass obstructing the bowel**
- **Blood invasion; Amoebic liver abscess , lung, brain**
- **Direct extension**

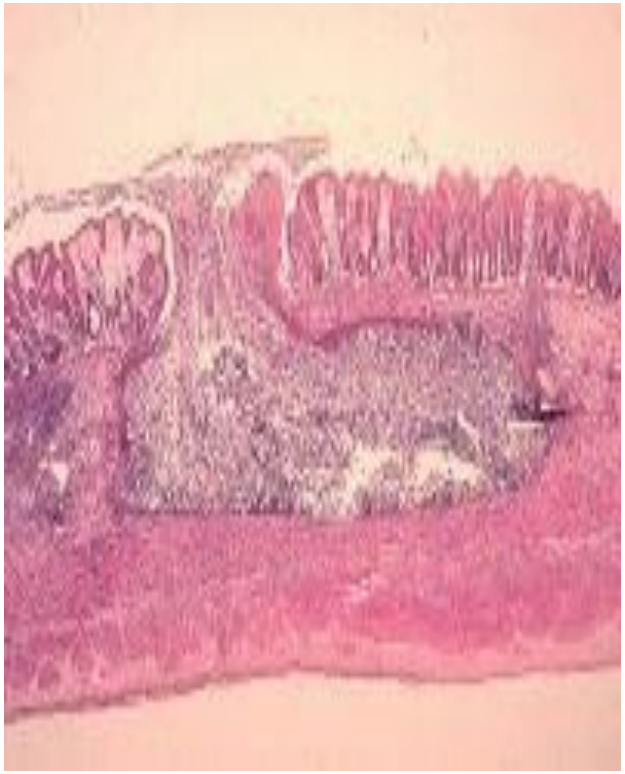
Note

Amoebic hepatic cyst → Hydatid cyst

Amoebic liver abscess → Entamoeba

PATHOLOGY: Intsetinal amoebiasis :





Formation of flask-shaped ulcers.

Complications and sequelae

Perforation
Haemorrhage (rare)

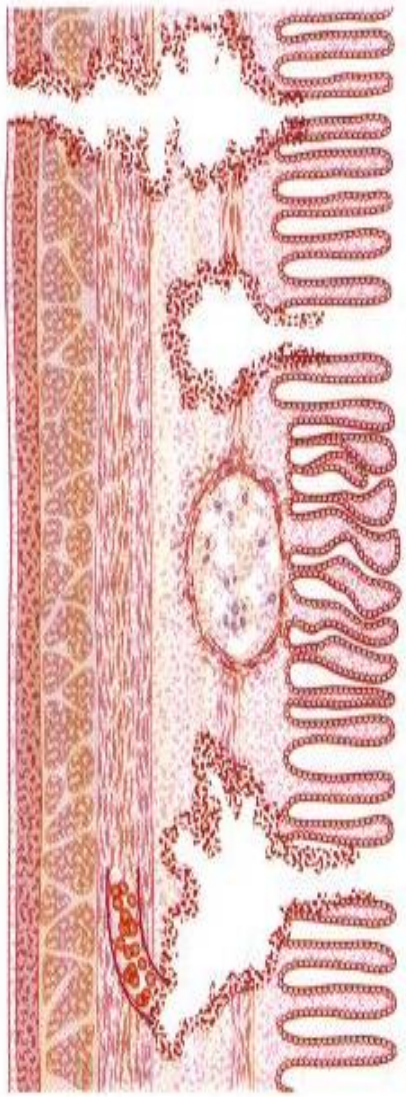
Peritonitis
Haemorrhage

Secondary infection

Surrounding inflammatory reaction and fibroblastic proliferation

Amoeboma (rare)
(Clinically simulates neoplasm)
– intussusception
– obstruction

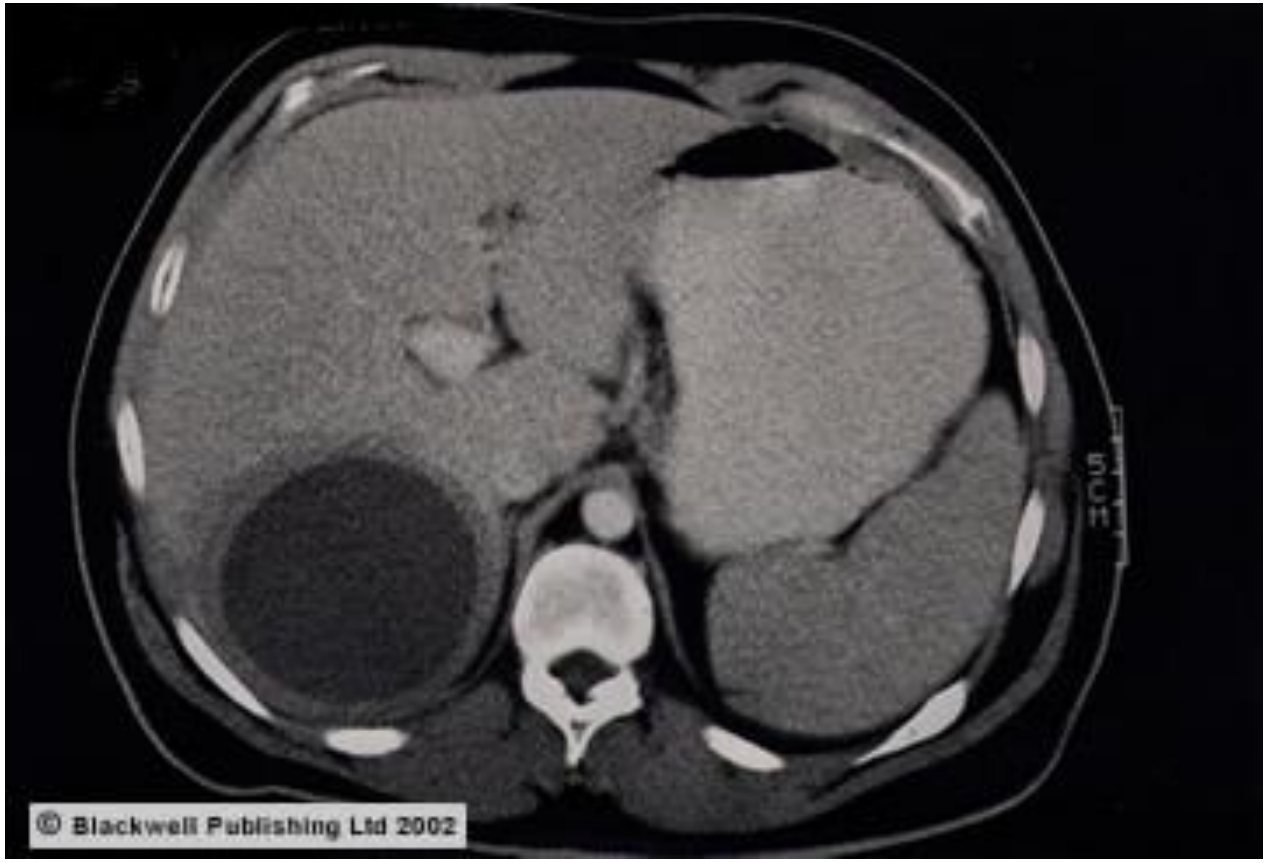
A mass under oedematous mucosa with
– internal abscesses of necrotic tissue and amoebae
– surrounding granulomatous tissue zone with eosinophils, lymphocytes and fibroblasts
– outer firm nodular fibrous tissue



Invasion of blood vessels

Extraintestinal lesions-page 52

Direct extension outside bowel



A 30-year-old male experienced diarrhea for two weeks with fever of 39° C, nausea, vomiting, malaise and right upper abdominal pain. Physical examination revealed hepatomegaly 6 cm below the right costal margin. CT scan showed a single hypodense mass in the rigth lobe of 7.8 x 5.2 cm, round, with well defined borders. Serology was positive for Enamoeba histolytica at 1/512.

Amebic liver abscess was diagnosed.

Diagnosis of Amoebiasis

Intestinal:

- Stools :
  - **microscopy,**
    - * Wet mount (cysts and trophozoites)
    - * Concentration methods (only cysts)
  - **antigen detection**, عشان نفرق
  - **molecular methods** — Detection of parasitic DNA or RNA in feces via probes - can also be used to diagnose amebic infection and to differentiate between the different strains.
- Serology (mainly for invasive infections): IHA , ELISA.
- Colonoscopy with biopsy and histological examination .

Extra-intestinal:

- Serology: IHA , ELISA
- Surgical aspirate (needle aspiration not done as a diagnostic procedure due to risk of extension),to look for trophozoite.

Main Drugs for Treatment of Amoebiasis

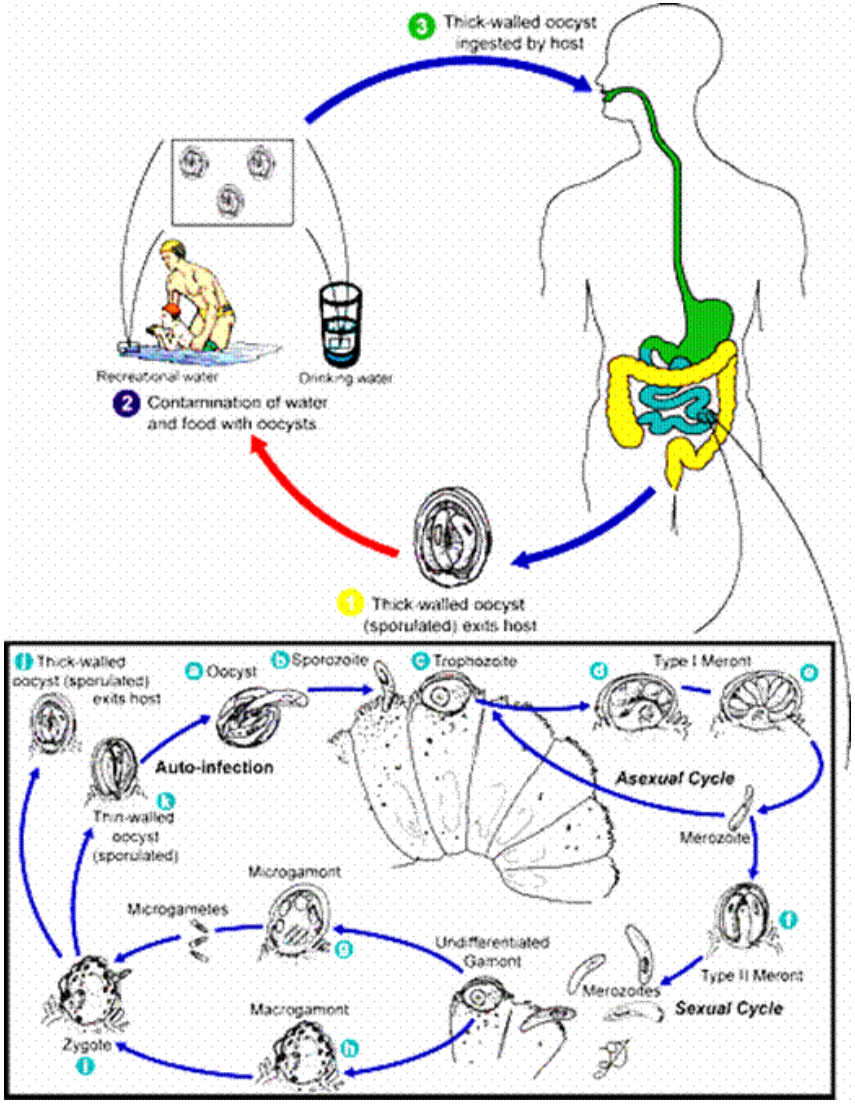
Intestinal :

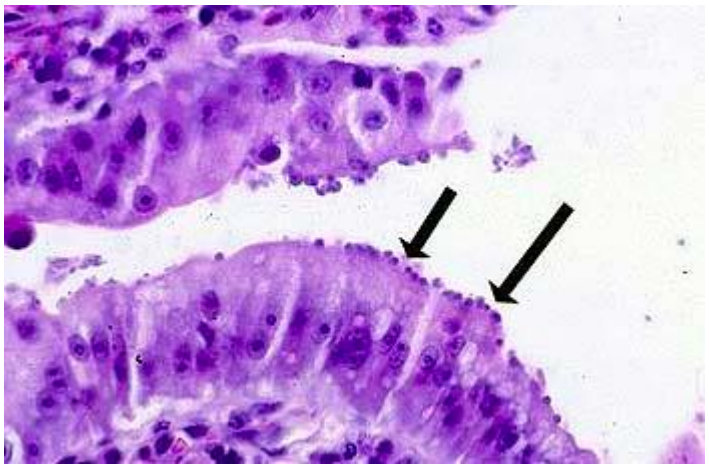
- Asympromatic (cysts only): diloxanide furoate (Furamide)
- Symptomatic(cysts and trophozoites): metronidazole

Extra-intestinal:

Metronidazole

Cryptosporidium Parvum





Cryptosporidium

Cryptosporidium is an intracellular protozoan parasite that is associated with self-limited diarrhea in immunocompetent hosts and **severe debilitating diarrhea** with weight loss and malabsorption in HIV-infected patients.

The diagnosis of cryptosporidiosis is generally based upon microscopy since *Cryptosporidium* species cannot be cultivated in vitro.

Transmission of cryptosporidiosis occurs via spread from an infected person or animal, or from a fecally contaminated environment, such as a food or water source.

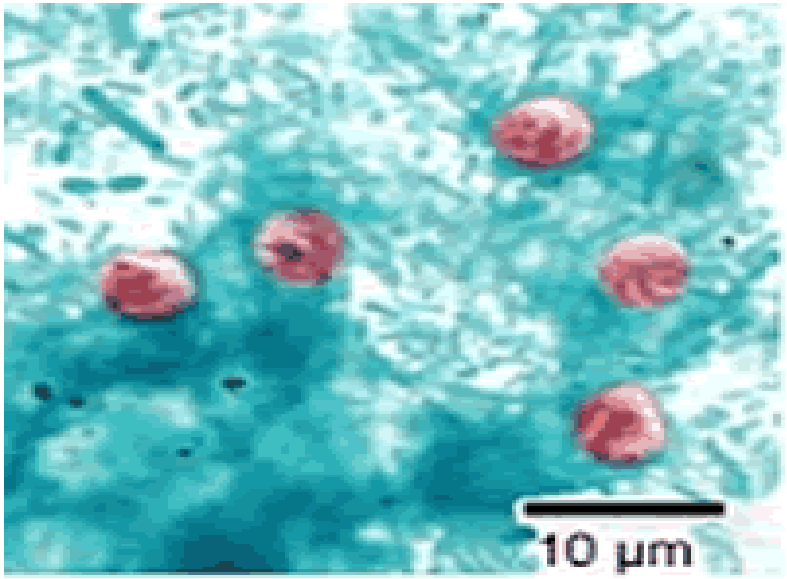
Main pathology: sever diarrhea

Mainly in: HIV, immunocompromised

Cryptosporidium Diagnosis

***Cryptosporidium* , safranin**

The diagnosis of cryptosporidiosis is generally made by microscopy, Ag.detection in stools .



Cryptosporidium

acid-fast stain (ziehl neelsen stain)

Crypto-Gardia : Ag detection test in stools

Cryptosporidiosis Treatment

Self-limited in immunocompetent patients

In AIDS patients : **paromomycin**

Haemoflagellates

Leishmania & Trypanosomes

Leishmania Parasites and Diseases

SPECIES	Disease
Leishmania tropica* ***Leishmania major**** *Leishmania aethiopica* *Leishmania mexicana*	Cutaneous leishmaniasis
Leishmania braziliensis	Mucocutaneous leishmaniasis
Leishmania donovani* ***Leishmania infantum**** *Leishmania chagasi*	Visceral leishmaniasis

* Endemic in Saudi Arabia

Sand fly

CUTANEOUS LISHMANIASIS THE COMMON TYPE

This starts as a **painless papule** on exposed parts of the body ,generally the face.

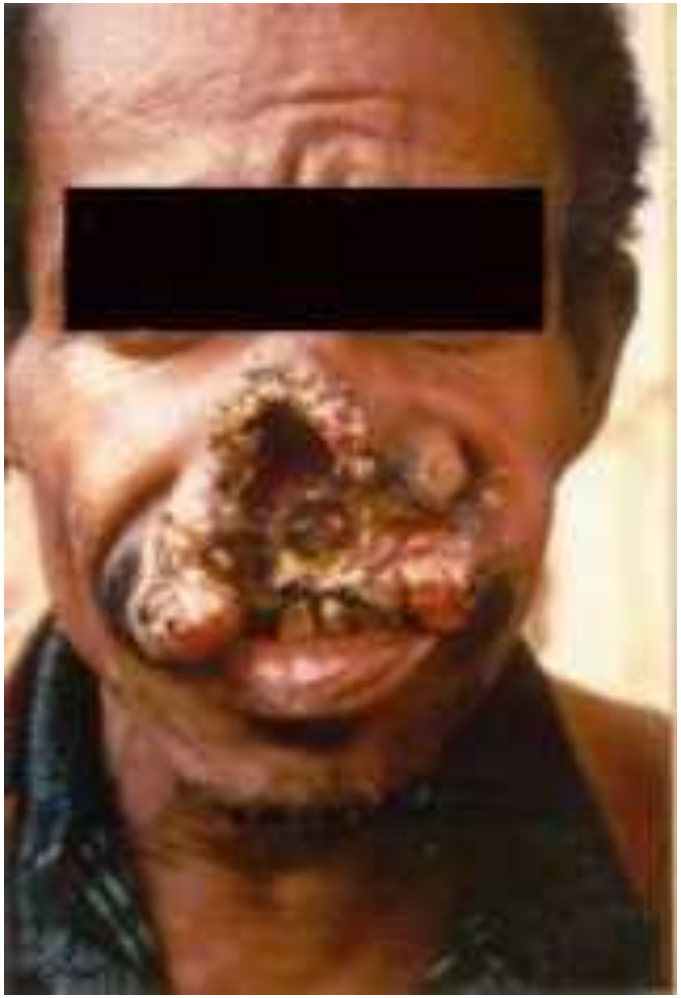
The lesion ulcerates after a few months producing an ulcer with an indurate margin.
In some cases the ulcer remains dry and heals readily (**dry-type-lesion)** .

In some other cases the ulcer may spread with an inflammatory zone around , these known as (**wet-type-lesion**) which heal slowly.

Mucocutaneous leishmaniasis

The lesion starts as a pustular swelling in the mouth or on the nostrils. The lesion may become ulcerative after many months and then extend into the naso- pharyngeal mucous membrane.

Secondary infection is very common with destruction of the nasal cartilage and the facial bone .



cutaneous & muco-cutaneous leishmaniasis

Diagnosis:

The parasite can be isolated from the margin of the ulcer.

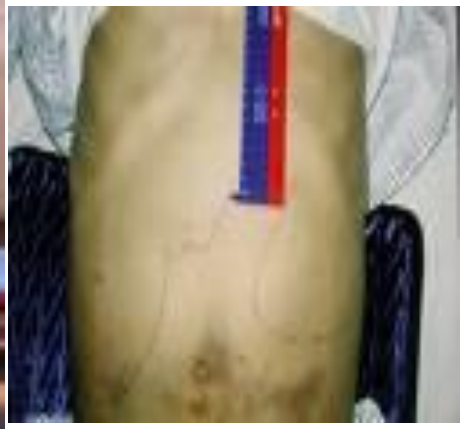
Smear: Giemsa stain – microscopy for LD bodies (amastigotes).

Biopsy: microscopy for LD bodies or culture in **NNN** medium for promastigotes.

Visceral leishmaniasis

- There are geographical variations.
- The diseases is called **kala-azar**
- *Leishmania infantum* mainly affect children
- *Leishmania donovani* mainly affects adults
- The incubation period is usually 4-10 months.
- The early symptoms are generally low grade fever with malaise and sweating .
- In later stages ,the fever becomes intermittent and their can be liver enlargement or spleen enlargement or hepatosplenomegally because of the hyperplasia of the lymphoid –macrophage system.

Hepatosplenomegaly in visceral leishmaniasis



Note

Hepatosplenomegaly with LD bodies → Leishmania
Hepatosplenomegaly with egg in stool → Schistosoma

Visceral leishmaniasis

Diagnosis:

(1) Parasitological diagnosis:

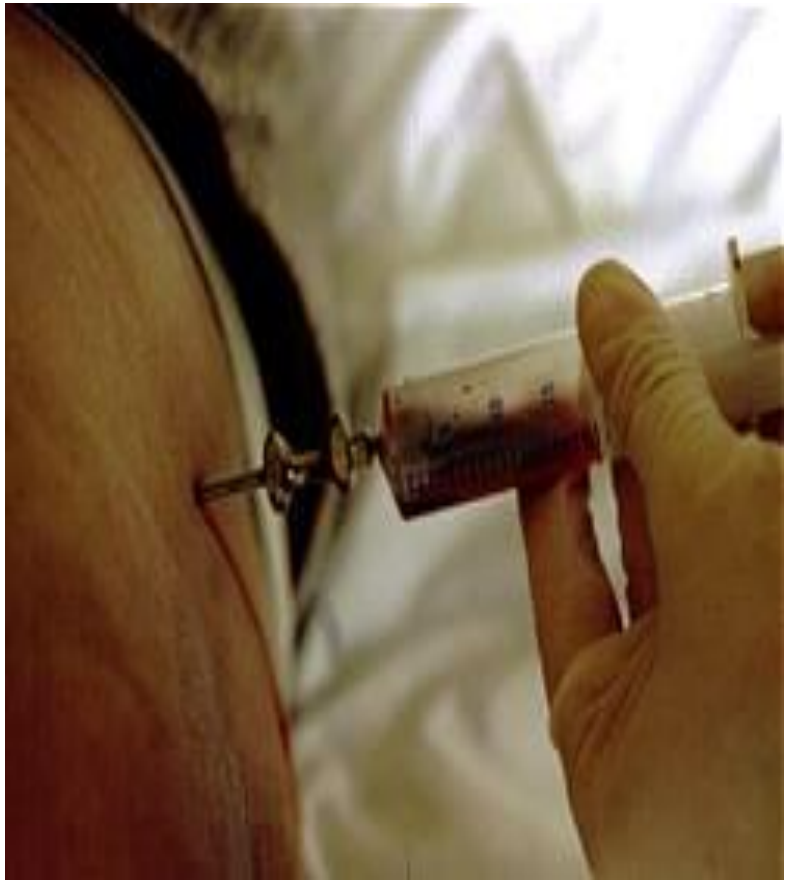
Bone marrow aspirate
Splenic aspirate
Lymph node
Tissue biopsy

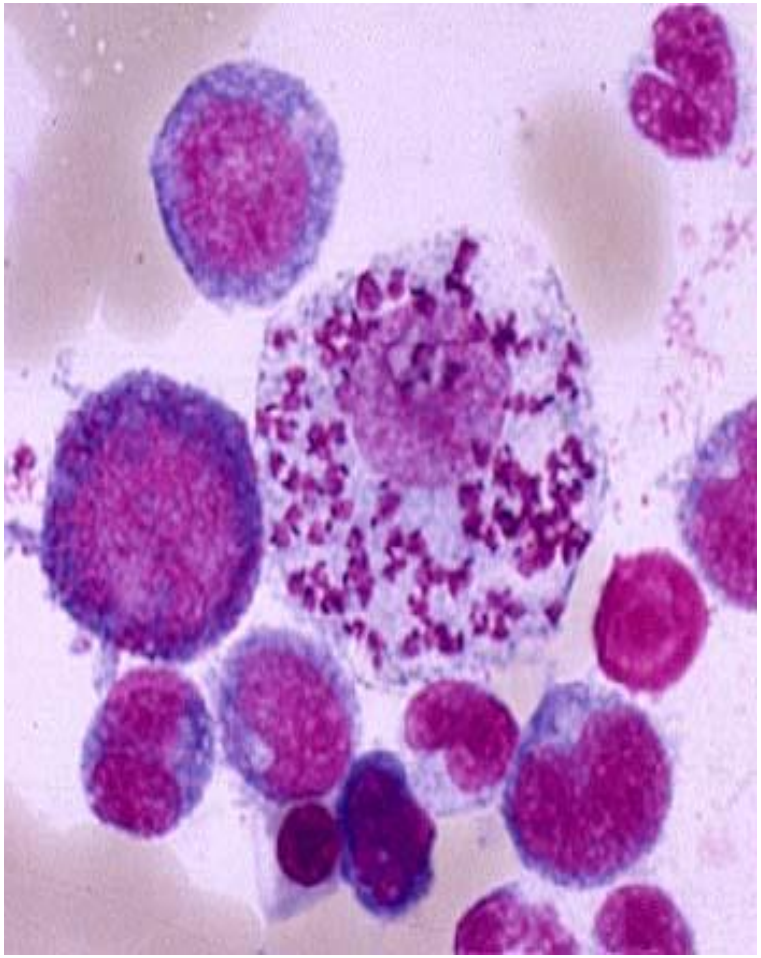
→ 1. microscopy
→ 2. culture in NNN medium

(2) Immunological Diagnosis:

- Specific serologic tests: Direct Agglutination Test (DAT), ELISA, IFAT
- Skin test (leishmanin test) for survey of populations and follow-up after treatment.

Bone marrow aspiration





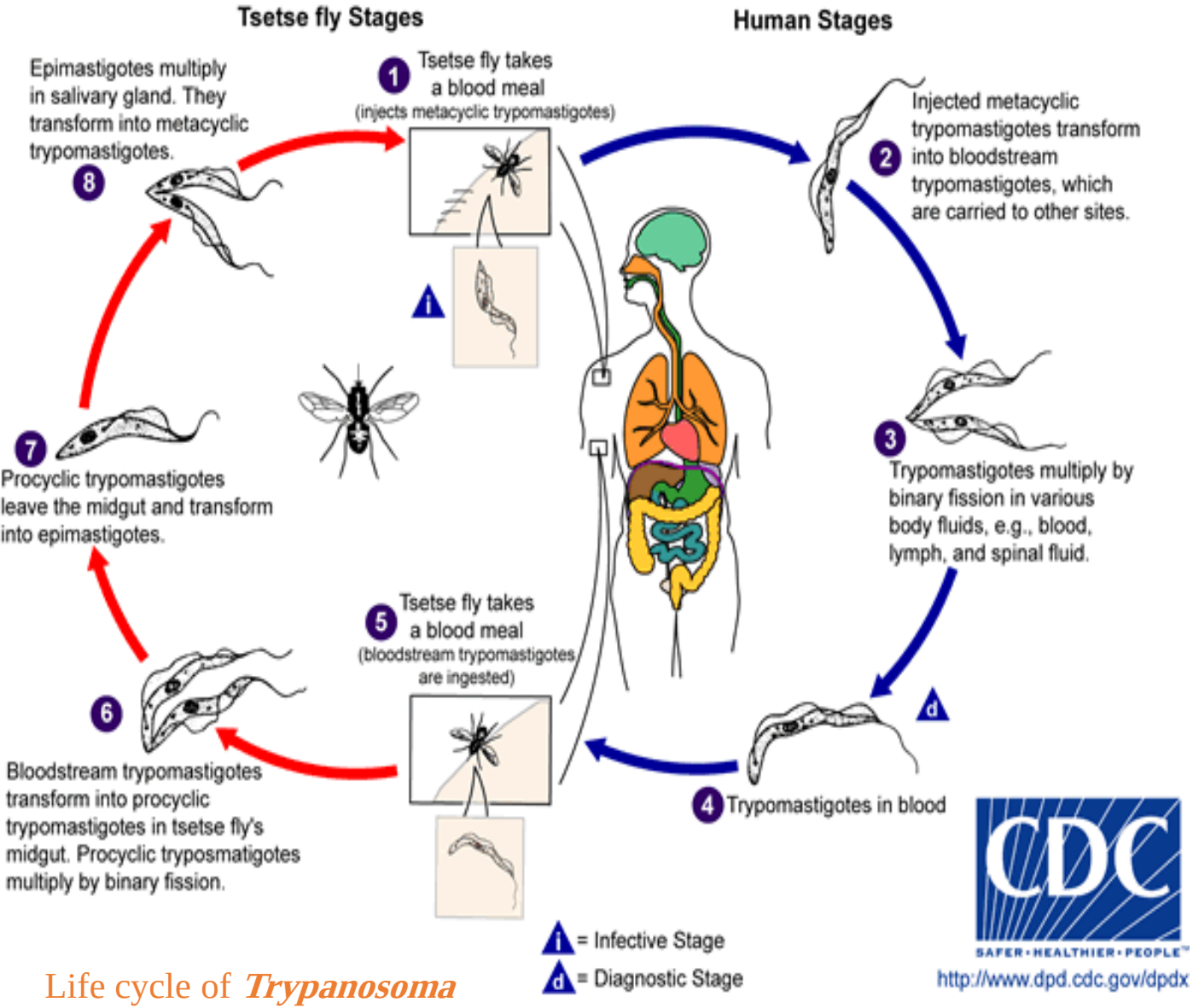
Bone marrow amastigotes

(Leishman_Donavan bodies) seen iside macrophage

African Trypanosomiasis

Infective stage:
trypomastigotes

Diagnostic stage:
trypomastigotes



Life cycle of ***Trypanosoma brucei gambiense*** & ***T. b. rhodesiense***

Tsetse fly

Pathology and clinical picture

1- A primary reaction occurs at the site of inoculation of Trypanosoma ,skin stage: **chancre** which resolve in 2-3 weeks.

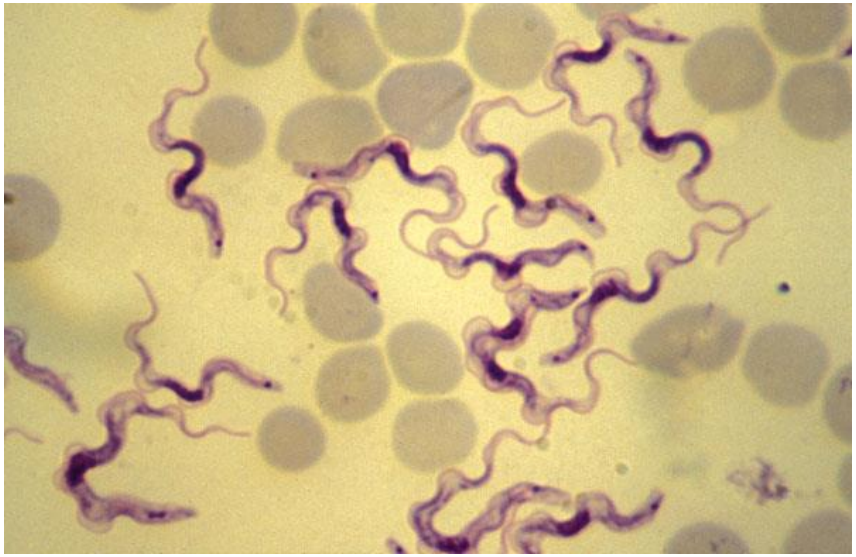
2- Systemic Haemato-lymphatic stage: **fever intermittent fever**, headache and generalized lymphadenopathy mainly in the cervical and sub occipital region (**Winterbottom's sign**), anaemia, generalized organ involvement.

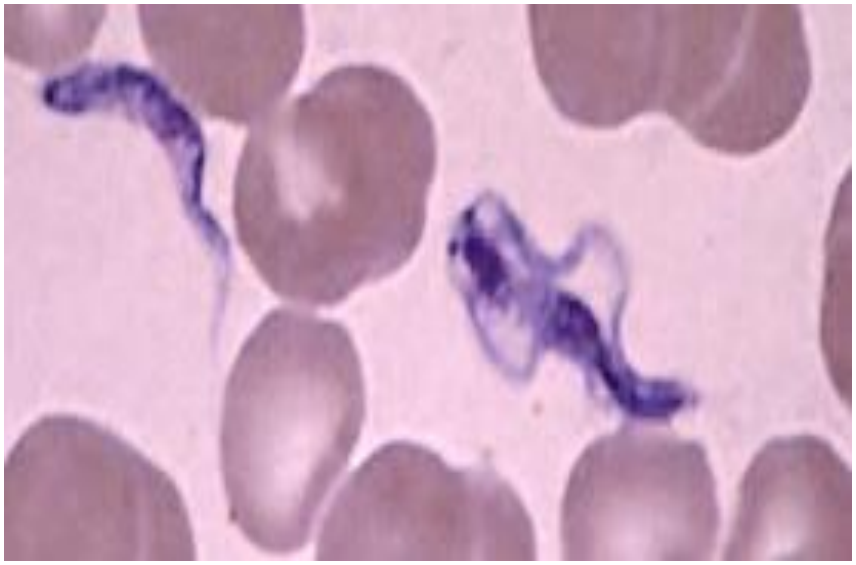
3- Central nervous system stage (CNS): Meningoencephalitis.

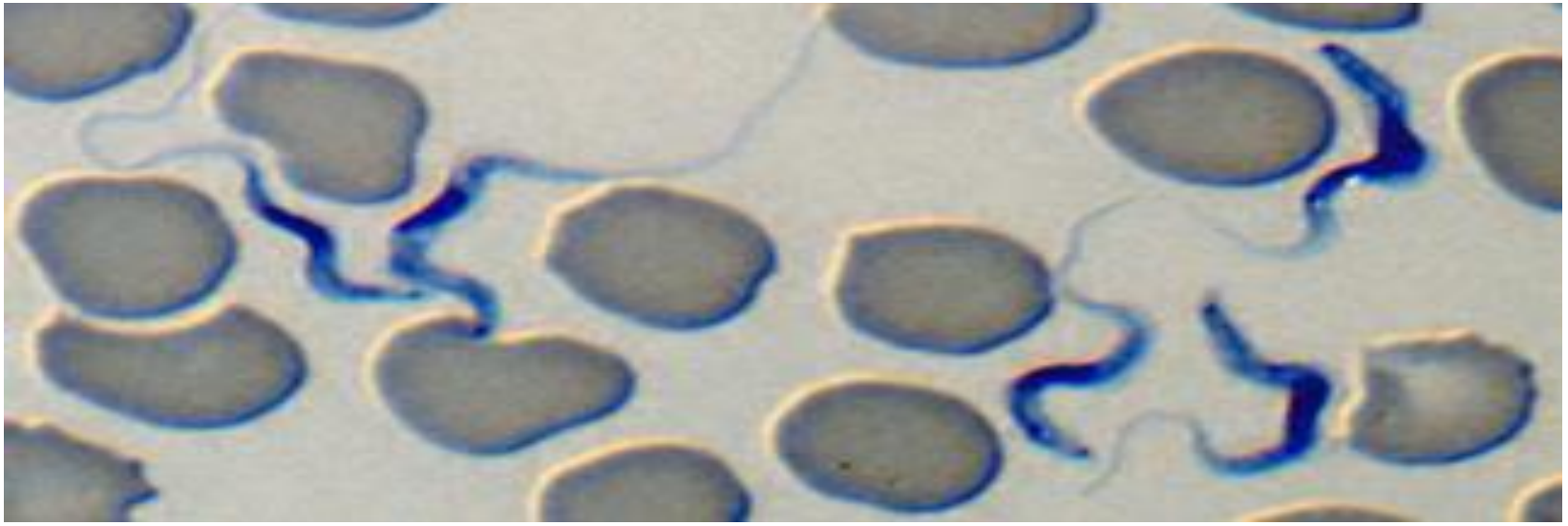
(Development of the disease more rapid in *Trypanosoma brucei rhodesiense*)

3rd stage CNS: CNS involvement in typical case there is daytime sleeping, psychological changes ,tremors ,convulsions and finally coma.

Trypanosoma in peripheral blood & CSF







Laboratory test for African Trypanosomaiasis

- The gold standard for is identification of trypanosomes in patient sample by microscopic examination. **To see trypomastigote.** Samples as blood or tissue biopsy or fluid from (chancre),lymph node aspirate ,bone marrow and cerebrospinal fluid in neurological stage.

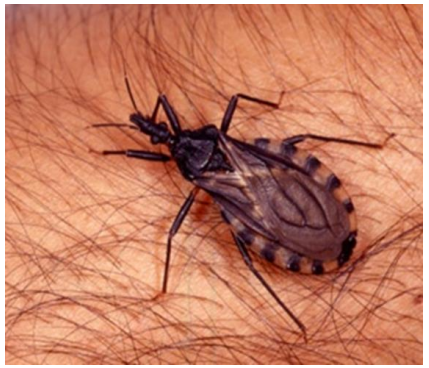
- SEROLOGICAL TEST NOT WIDELY AVAILABLE.

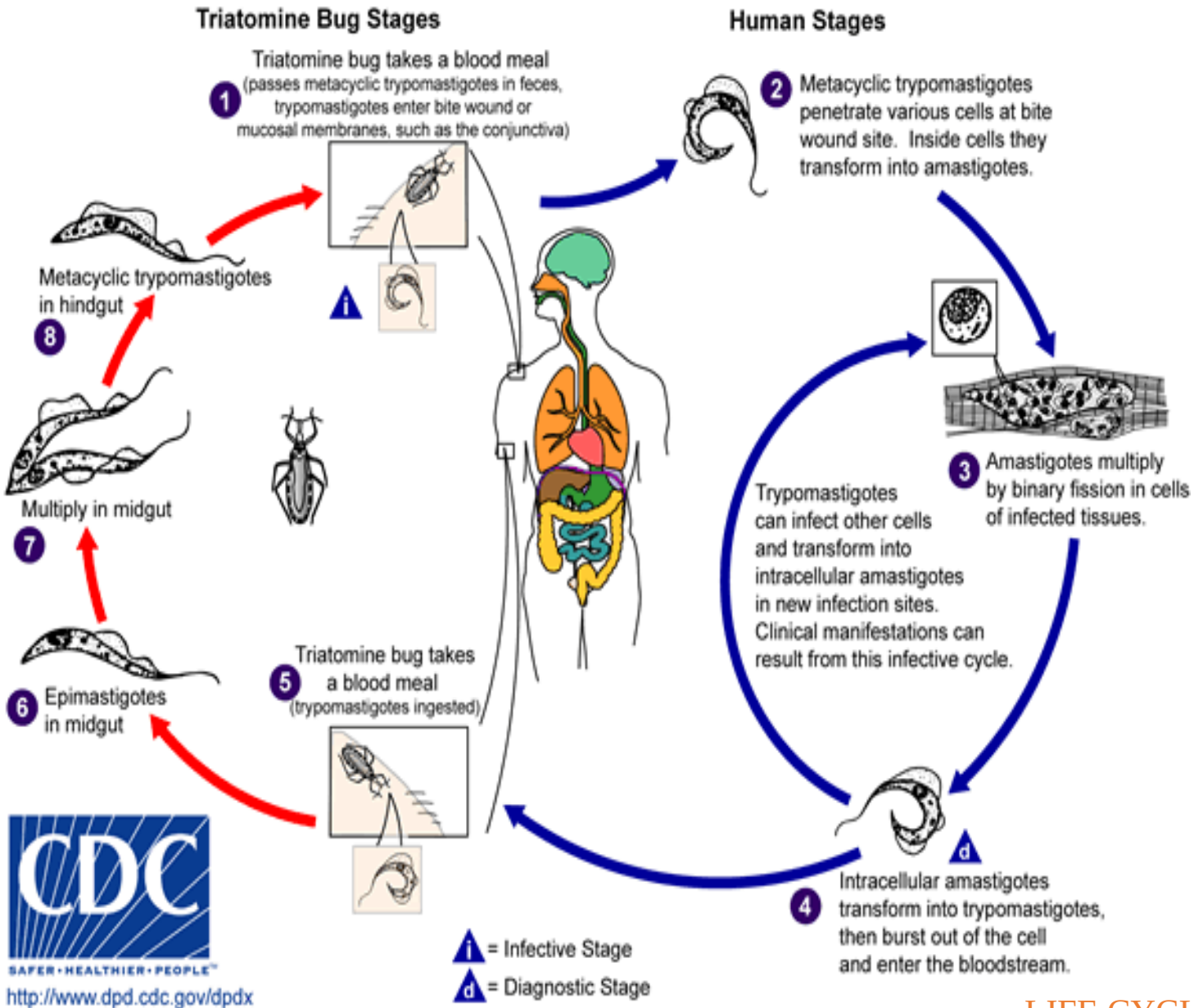
- All patients diagnosed with African Trypanosome must have their cerebrospinal fluid examined to determine whether there is involvement of the central nervous system ,since the choice of he treatment drugs will depend on the stage of the disease.

- CNS involvement include increased protein and WBC count more than 5.and we see trypanosome in CSF

AMERICAN TRYPANOSOMIASIS

Reduviid (*Triatomine*) bug



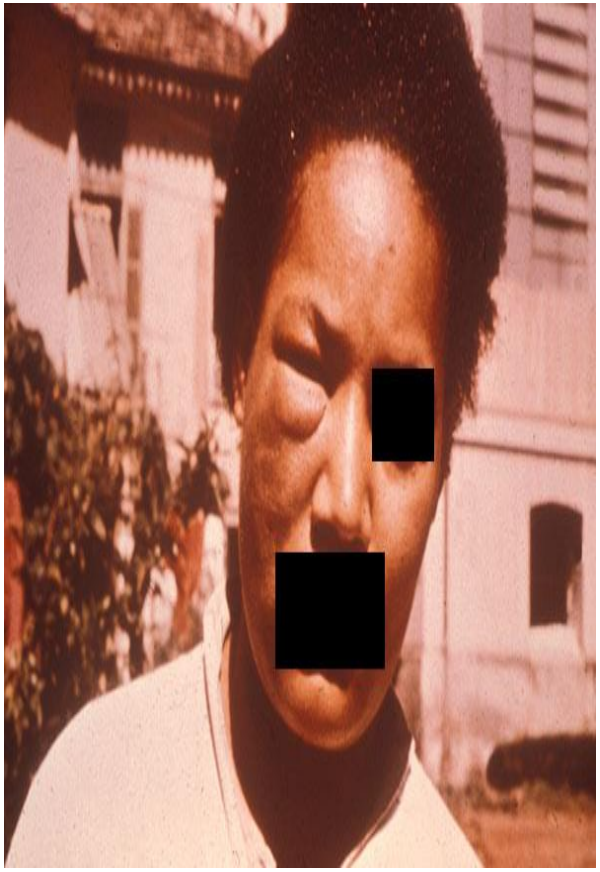


LIFE CYCLE OF *Trypanosoma cruzi*

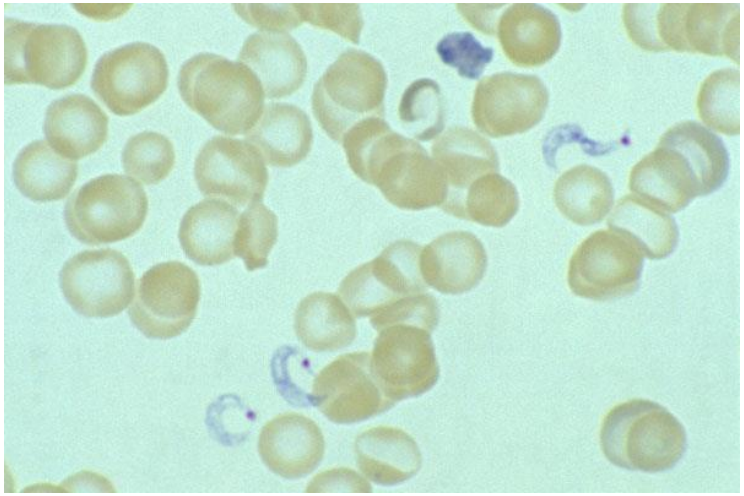
American trypanosomes (Chaga's disease)

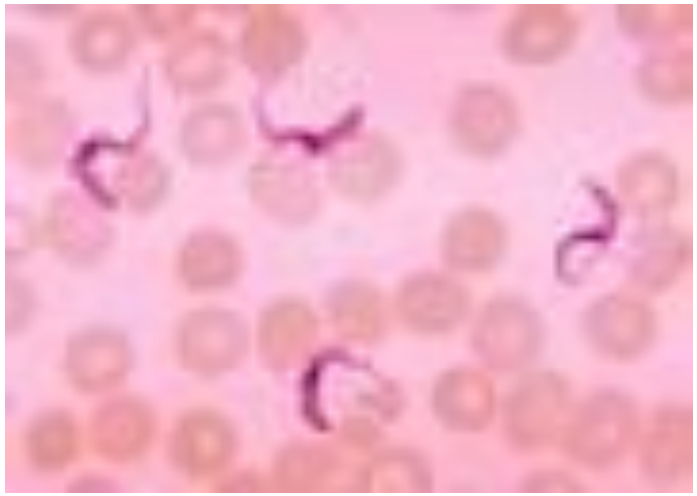
The parasites produce focal lymphangitis and oedema at the site of parasites entry (**chagoma**). mainly on the face near the eyelids ,it produces a swelling of the eye and temporal region with conjunctivitis (**ROMANA'S sign**) , after that parasites (trypomastigote) enter the blood stream and find there way into cells mainly **the cardiac muscles cells** become **(amastigote).** The most constant feature of the cardiac disease is cardiomyopathy , in severe cases can lead to partal or complete heart block which may lead to cardiac failure.

Ocular lesion (Romana’ sign)

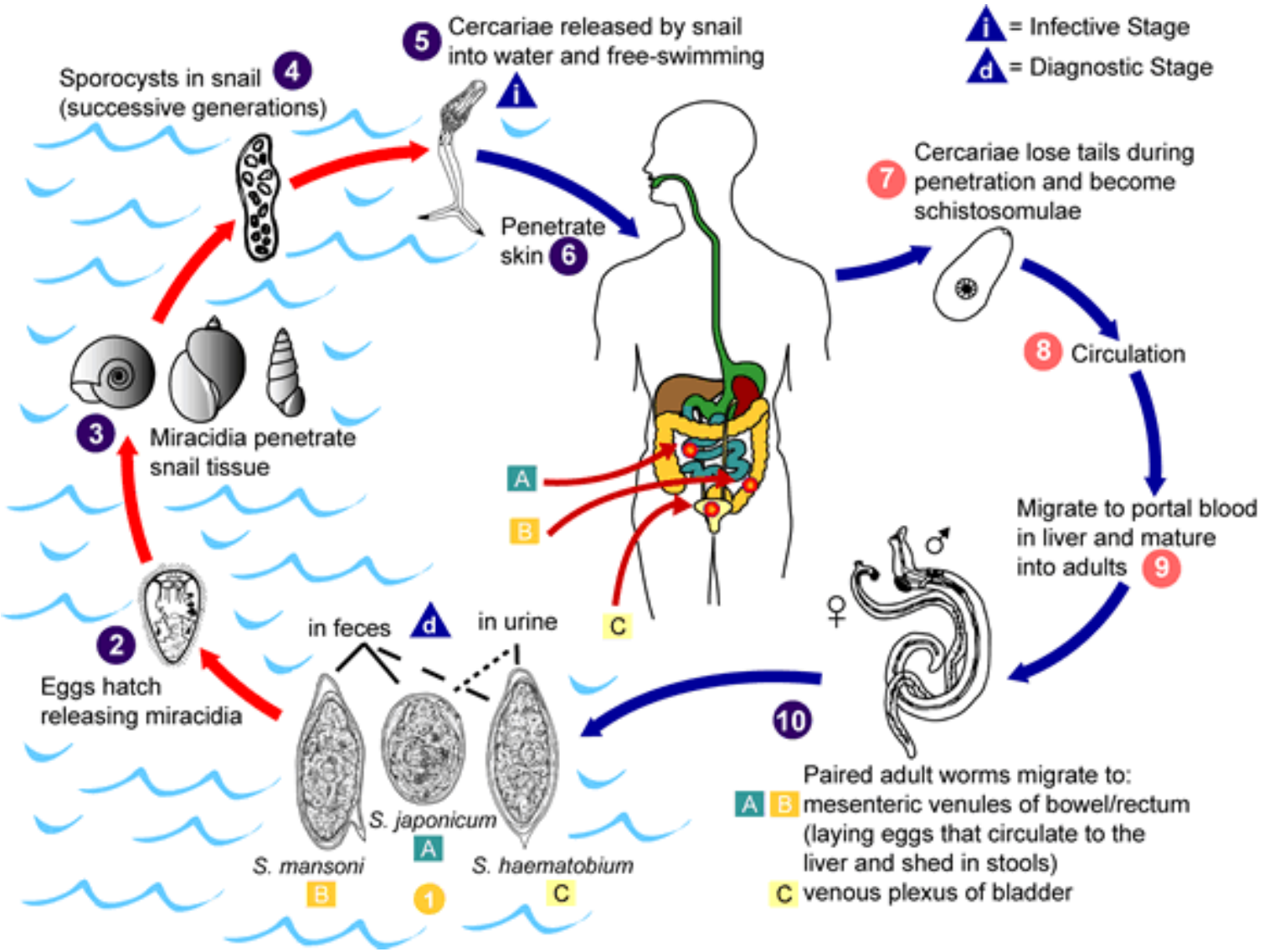


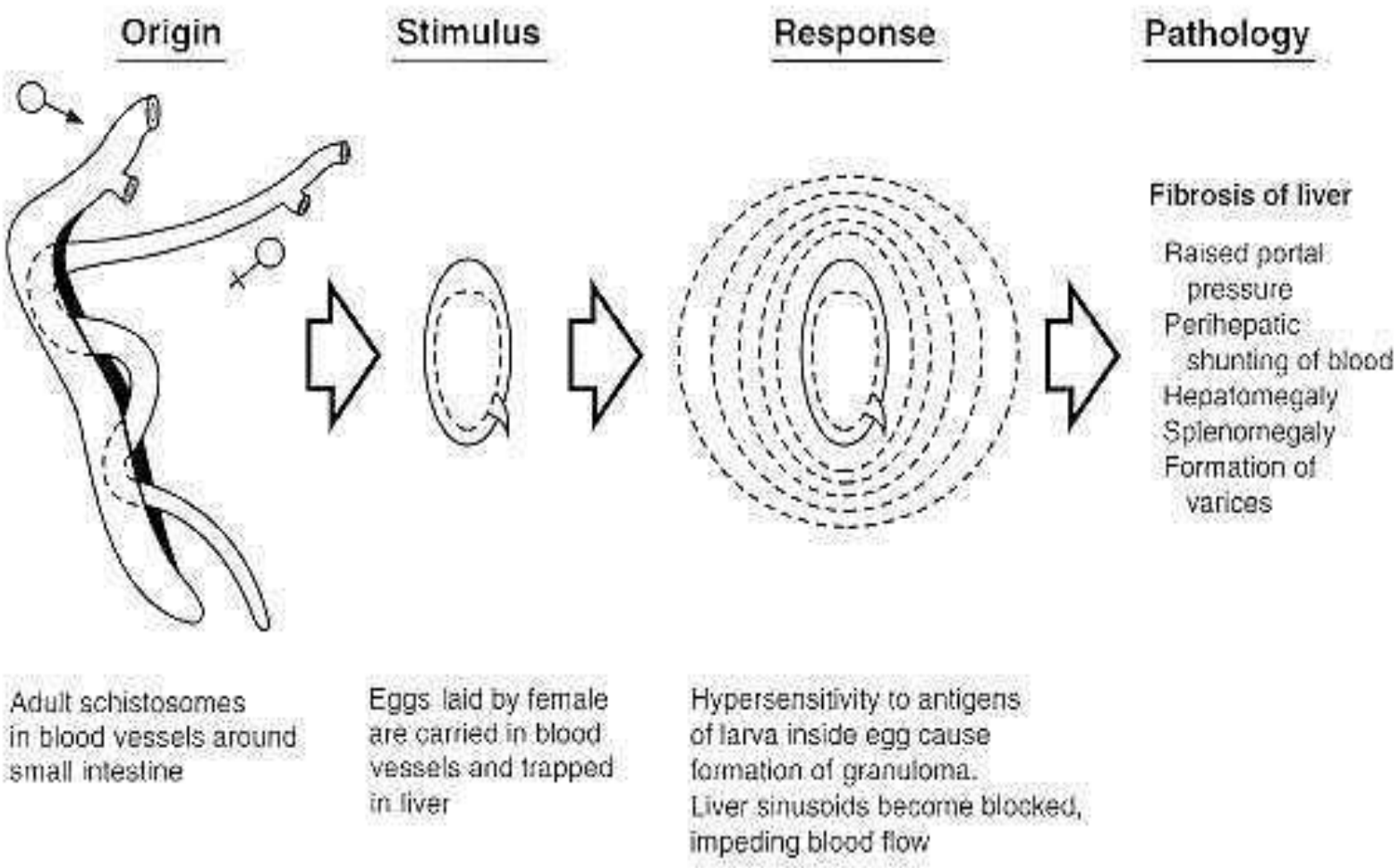
C-shape
Trypomastigote in peripheral blood





Schstosoma


i = Infective Stage
d = Diagnostic Stage
5 Cercariae released by snail into water and free-swimming
Sporocysts in snail (successive generations) 4
Penetrate skin 6
7 Cercariae lose tails during penetration and become schistosomulae
8 Circulation
Migrate to portal blood in liver and mature into adults 9
3 Miracidia penetrate snail tissue
A
B
C
2 Eggs hatch releasing miracidia
in feces d in urine
10
Paired adult worms migrate to:
A B mesenteric venules of bowel/rectum (laying eggs that circulate to the liver and shed in stools)
C venous plexus of bladder
S. japonicum A
S. mansoni B
S. haematobium C
1


Origin
Stimulus
Response
Pathology
Fibrosis of liver
Raised portal pressure
Perihepatic shunting of blood
Hepatomegaly
Splenomegaly
Formation of varices
Adult schistosomes in blood vessels around small intestine
Eggs laid by female are carried in blood vessels and trapped in liver
Hypersensitivity to antigens of larva inside egg cause formation of granuloma.
Liver sinusoids become blocked, impeding blood flow

Pathology of Schistosomiasis

Schistosoma haematobium

Causes urinary schistosomiasis

1- PREPATENT PERIOD 10-12 wks

2- EGG DEPOSITION AND EXTRUSION:

- painless haematuria
- Inflammation of bladder and burning micturition
- CNS involvement

3-TISSUE PROLIFERATION AND REPAIR:

- Fibrosis , papillomata in the bladder and lower ureter leading to obstructive uropathy.
- Periportal fibrosis
- Lung and CNS involvement

Schistosoma mansoni

Causes intestinal schistosomiasis

1- PREPATENT PERIOD 5-7 wks

2- EGG DEPOSITION AND EXTRUSION:

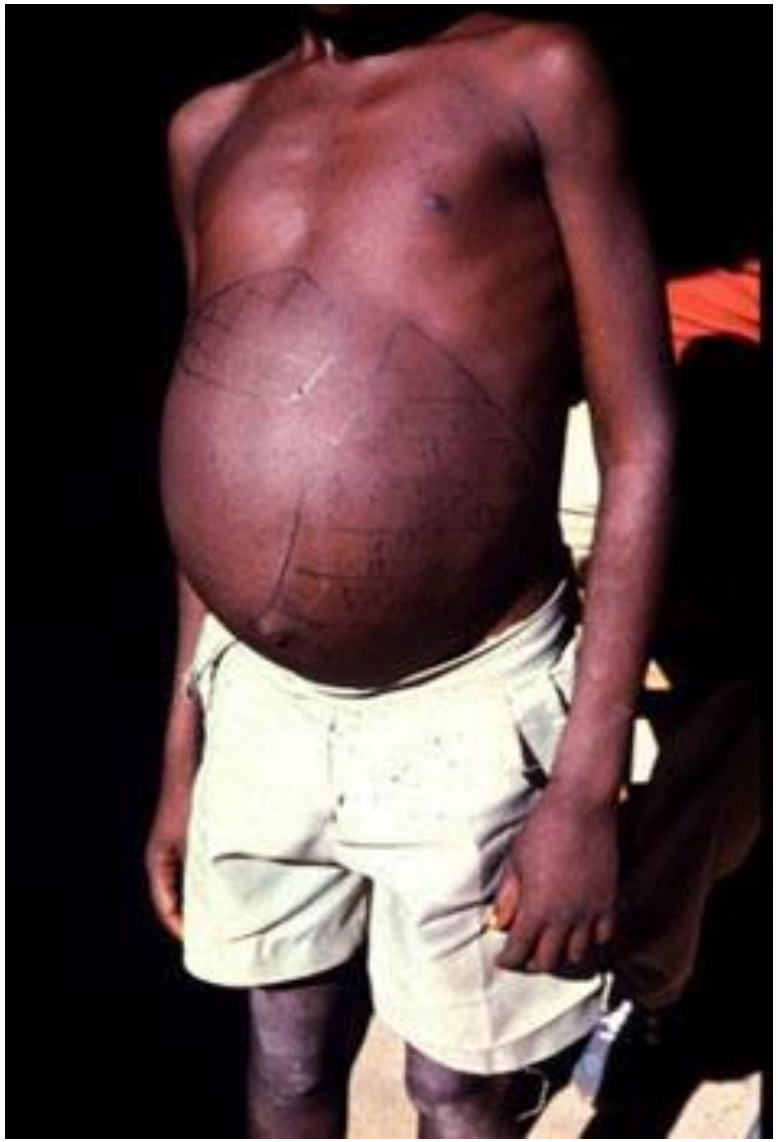
- dysentery (blood and mucus in stools),
- hepatomegaly splenomegaly
- CNS involvement

3- TISSUE PROLIFERATION AND REPAIR:Fibrosis :

- Papillomata in intestine
- Pperiportal fibrosis,hematemesis
- Lung and CNS involvement.

Allergic reaction to egg → formation of granuloma

Pathology: Garnuloma due to hypersensitivity reaction



Hepatosplenomegaly in chronic schistosomiasis

Portal hypertension in chronic schistosomiasis

Diagnosis of Schistosomiasis

<u>Schistosoma haematobium</u>

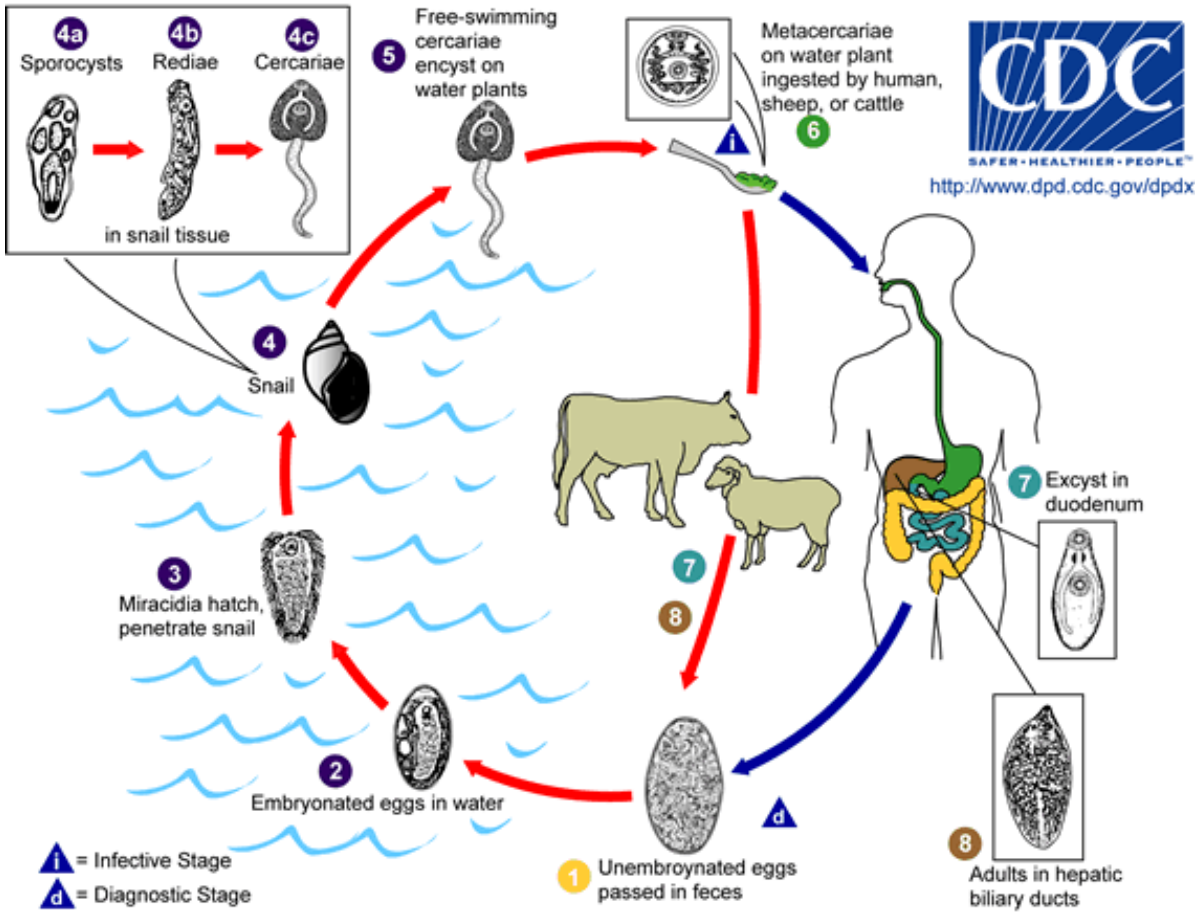
- ***Parasitological:***
  Examination of urine
- ***Immunological:***
  Serological tests
- ***Indirect:***
  Radiological
  Cystoscopy

Schistosoma mansoni

- ***Parasitological:***
  Examination of stools
- ***Immunological:***
  Serological tests
- ***Indirect:***
  Radiological
  endoscopy

Drug of choice for schistosomiasis is
Praziquantel

Life-cycle of *Fasciola hepatica*





Ingestion of infected aquatic plants containing **mertacercaria** is the mean way of transmission of fascioliasis

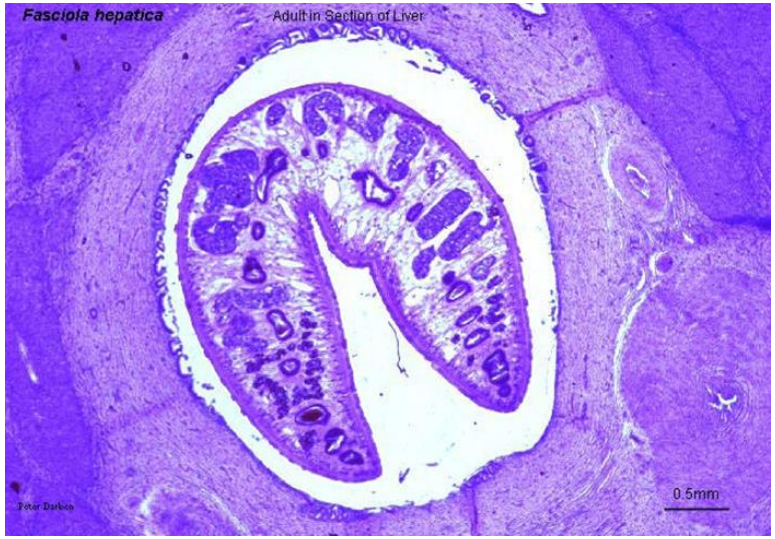
Fasciola hepatica

Pathology and clinical picture :

- True infection when eaten aquatic plants (adult fasciola) causes mainly biliary obstruction and liver damage .
- False infection is when eggs are eaten in infected animal liver and passed in stools.

Diagnosis: eggs in stools or duodenal aspirate.

Fasciola hepatica in bile duct



Egg in the stool of *Fasciola hepatica*

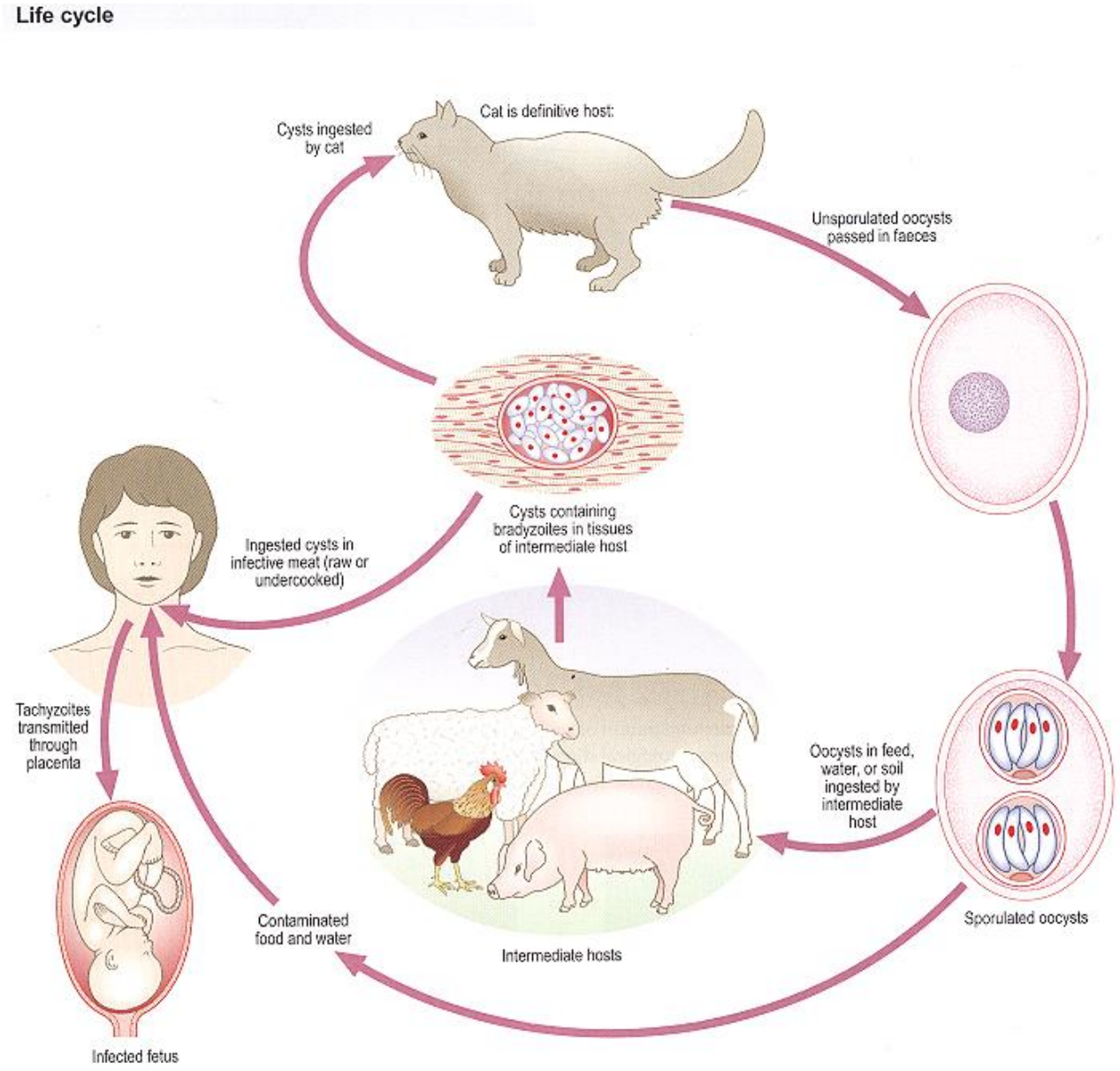
Fasciola hepatica: false infection

Toxoplasmosis

&

Other Blood Parasites

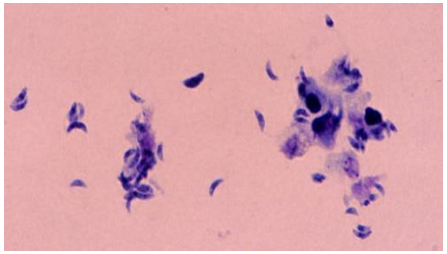
Toxoplasma gondii,
Life-cycle



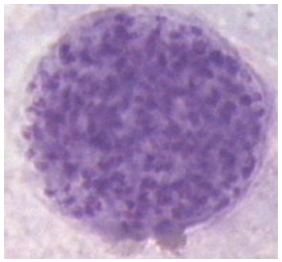
Toxoplasma gondii,

ACUTE PHASE

CHRONIC PHASE



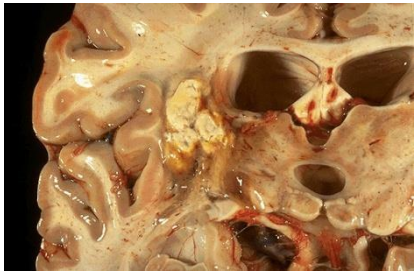
Immunity +



Immunity -

Tachyzoites: rapidly dividing forms

Bradyzoites: slowly dividing forms



ACTIVATION

TOXOPLASMOSIS

Transmission of infection:

1: Congenital (/1000 pregnancies)

2: Acquired :

Ingestion of oocyst:contaminated fingers,soil,water

Ingestion of cyst in undercooked meat.

Blood transfusion (including WBC platelets) and organ transplant

3: Reactivation of infection

Immunocompromised e.g. AIDS

Immunosuppression e.g. drugs

Toxoplasmosis in Pregnancy

- Abortion

- Overt disease. The symptoms vary widely, the classical triad of Congenital Toxoplasmosis is

  Hydrocephalus

  Intracranial calcification

  Chorioretinitis

- Subclinical infection: no symptoms at birth

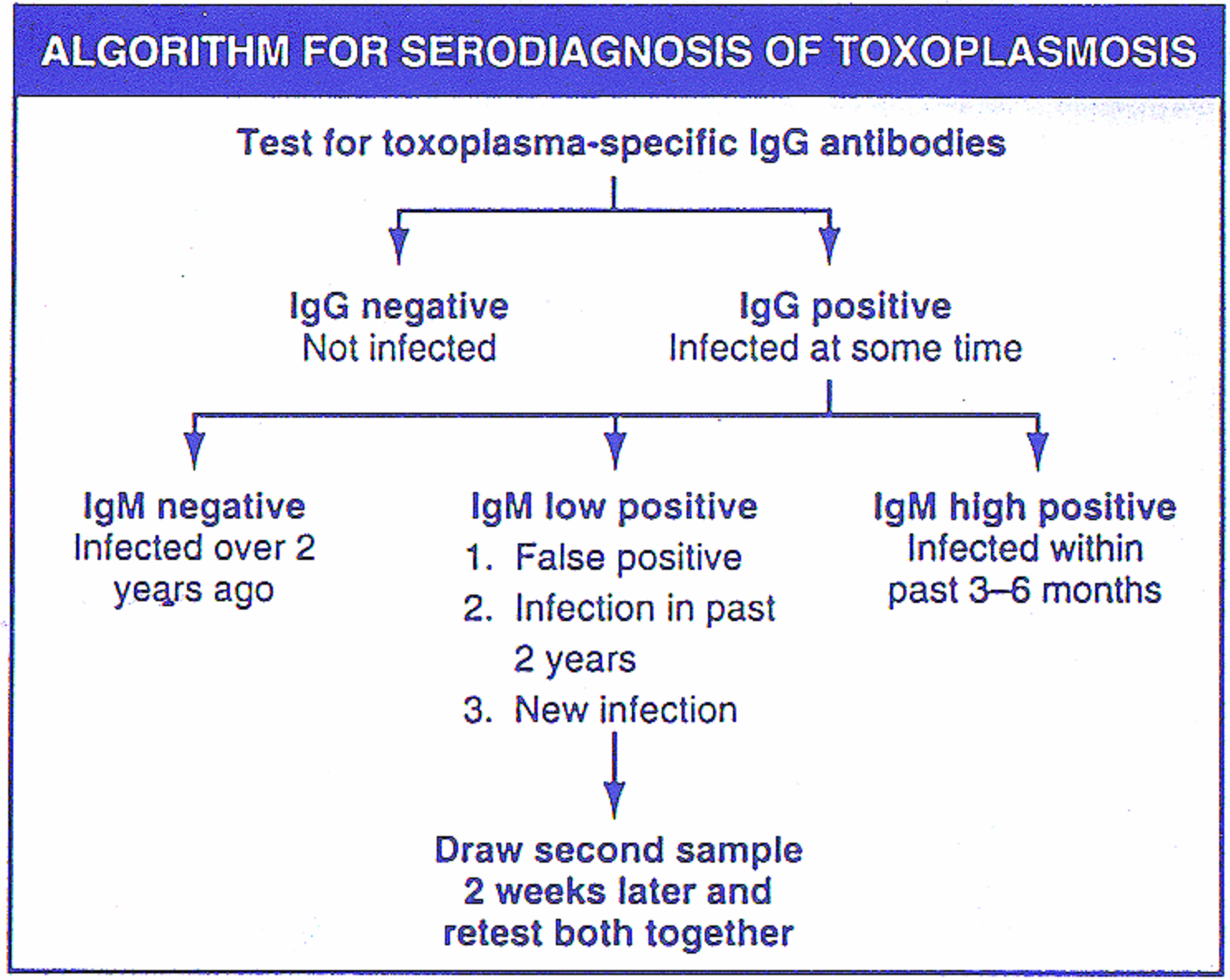
  Late onset symptoms (most common in the eyes: Chorioretinitis)

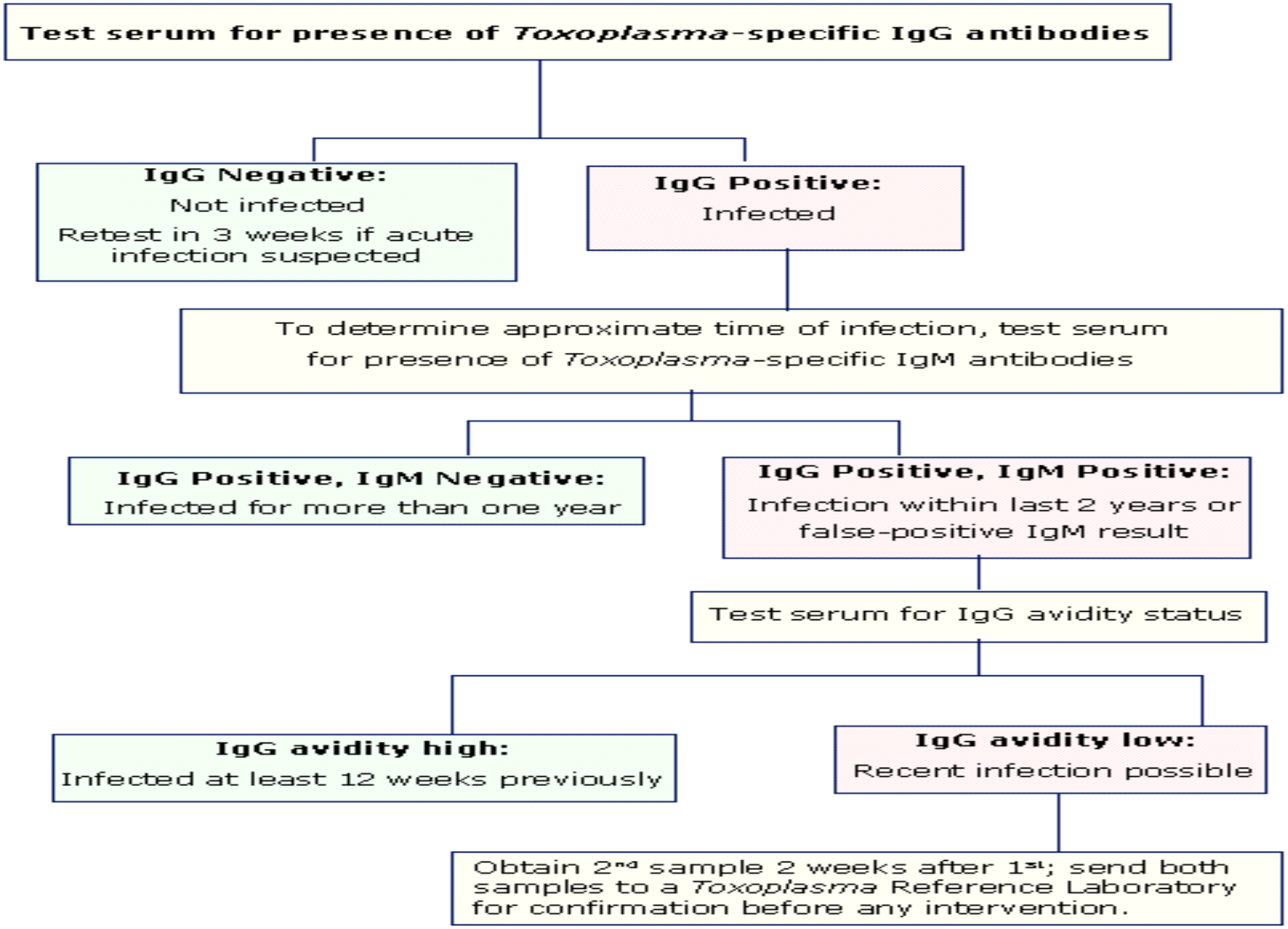
  No symptoms at all

In general :

The **earlier in pregnancy** the mother is infected, the lower is the risk of an infection of the fetus, but the severer is the disease.

The **later in pregnancy** the mother is infected, the higher is the possibility of fetal infection, and the disease is less severe (often subclinical infection)


ALGORITHM FOR SERODIAGNOSIS OF TOXOPLASMOSIS
Test for toxoplasma-specific IgG antibodies
IgG negative
Not infected
IgG positive
Infected at some time
IgM negative
Infected over 2 years ago
IgM low positive
1. False positive
2. Infection in past 2 years
3. New infection
IgM high positive
Infected within past 3–6 months
Draw second sample 2 weeks later and retest both together


Test serum for presence of *Toxoplasma*-specific IgG antibodies
IgG Negative:
Not infected
Retest in 3 weeks if acute infection suspected
IgG Positive:
Infected
To determine approximate time of infection, test serum for presence of *Toxoplasma*-specific IgM antibodies
IgG Positive, IgM Negative:
Infected for more than one year
IgG Positive, IgM Positive:
Infection within last 2 years or false-positive IgM result
Test serum for IgG avidity status
IgG avidity high:
Infected at least 12 weeks previously
IgG avidity low:
Recent infection possible
Obtain 2nd sample 2 weeks after 1st; send both samples to a *Toxoplasma* Reference Laboratory for confirmation before any intervention.

Treatment of Toxoplasmosis

Sulfonamides and pyrimethamine (Daraprim) are two drugs widely used to treat toxoplasmosis in humans.

Spiramycin: a drug used in France to treat pregnant women to minimize the effects of congenital toxoplasmosis

FILARIAL WORMS: (Adult worms + microfilariae)

1 ***Wuchereria bancrofti, Brugia malayi & B. timori:***

Lymphatic filariasis (adults in lymphatics, microfilariae in blood)

2 ***Loa loa:***

Adults in subcutaneous and subconjunctival tissues, causing Calabar swellings. Microfilariae in blood

3 ***Onchocerca volvulus:***

Adults in subcutaneous swellings Microfilariae : mainly in skin, eyes causing River blindness

LYMPHATIC FILARIASIS

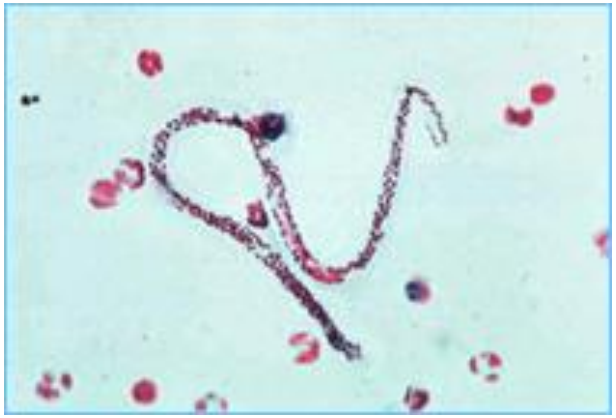
Diagnosis:

detection of microfilariae in blood in early stages of the disease:

Blood film, Knott's method

(concentration of 1 ml of blood), best 10 PM to 2 AM (nocturnal periodicity).

Immunological tests



Treatment: diethylcarbamazine (DEC) or ivermectin

Onchocerciasis

Malaria

Malaria Species

Five species of malaria infect humans:

Plasmodium falciparum (severe)

Plasmodium vivax (relapce)

Plasmodium ovale (relapce)

Plasmodium malariae

Plasmodium knowlesi (zoonotic from monkeys)

The main pathology of malaria → RBCs

Infective stage (human) → sporozoites

Infective stage (mosquito) → gametocytes

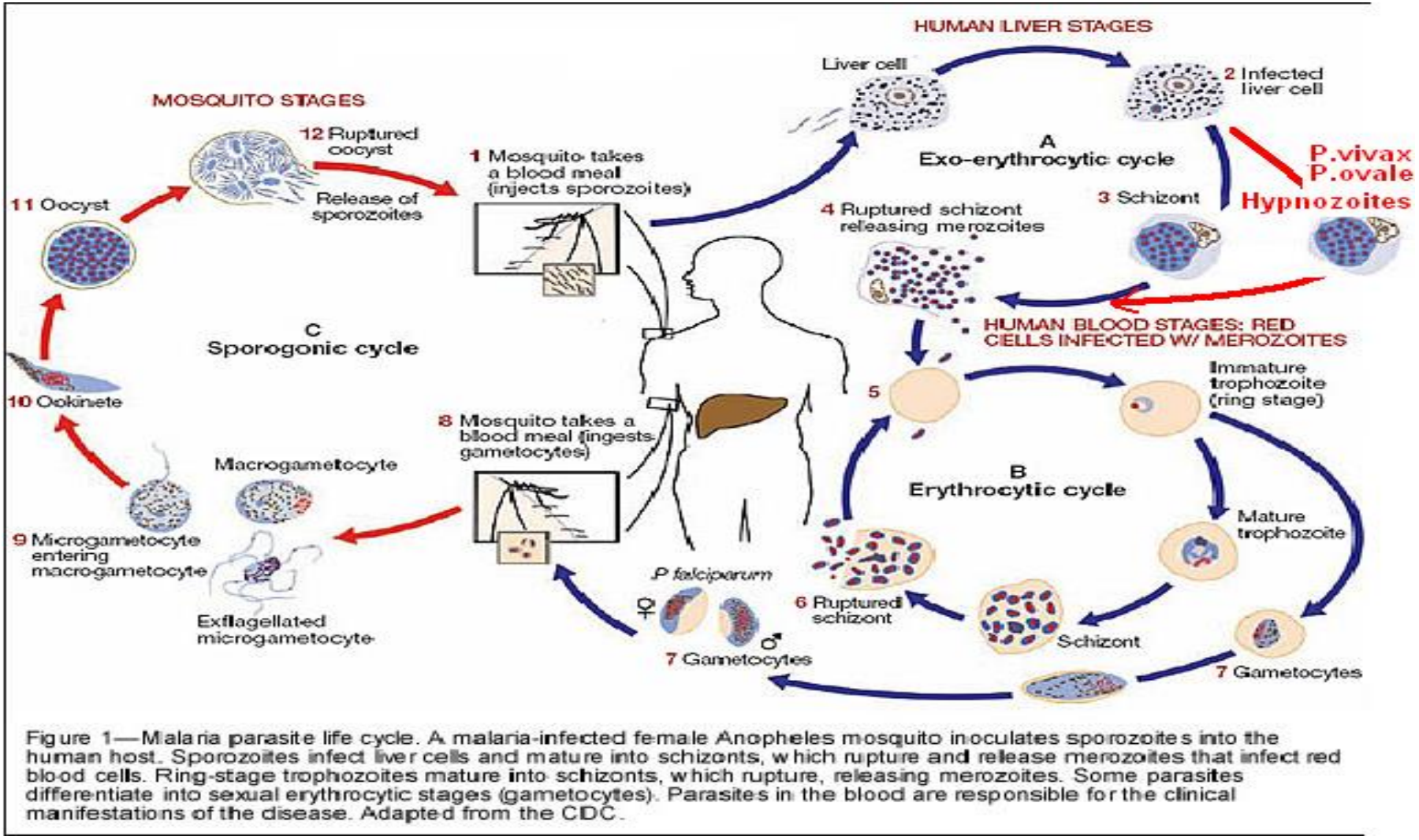
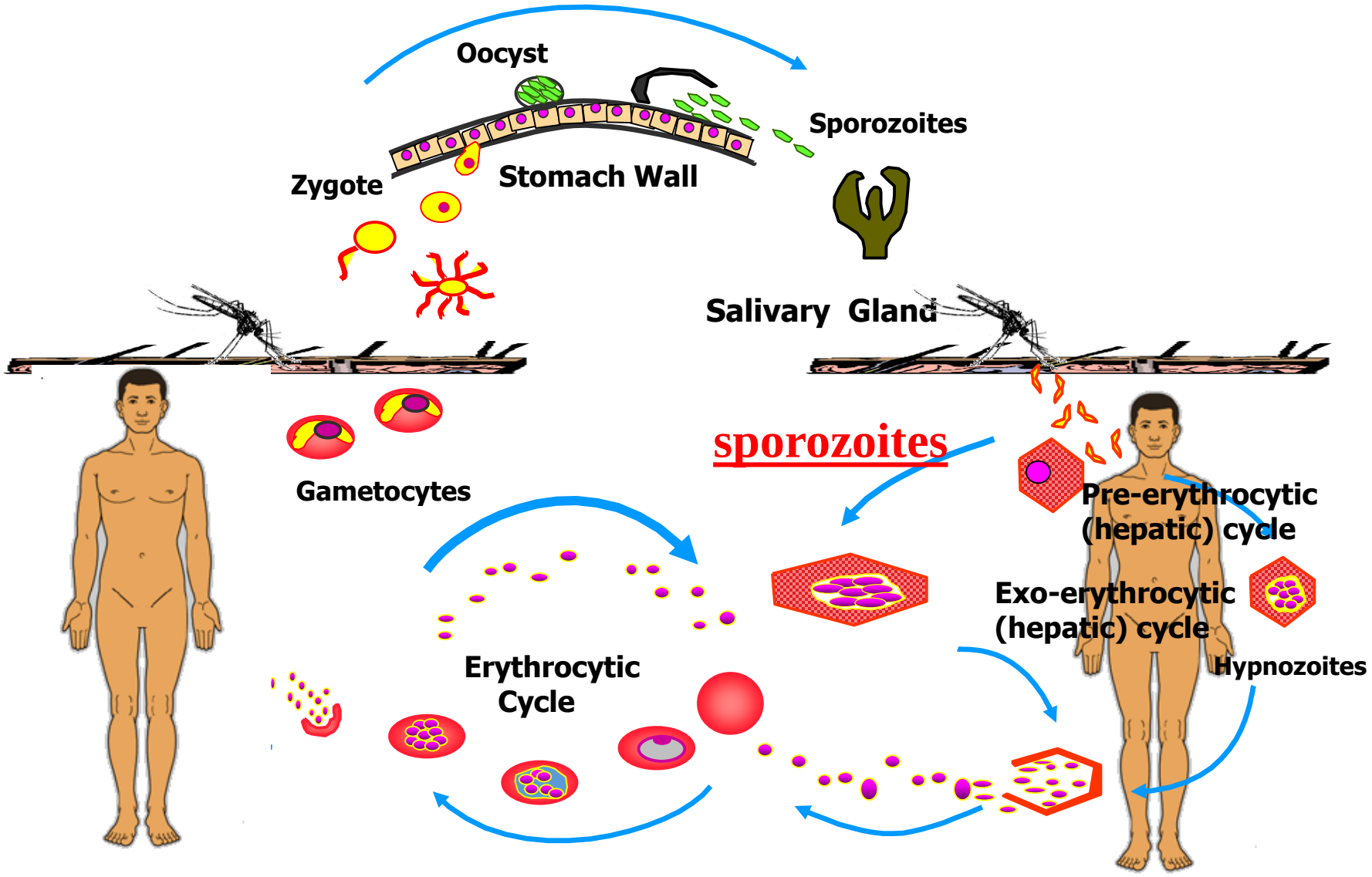


Figure 1—Malaria parasite life cycle. A malaria-infected female Anopheles mosquito inoculates sporozoites into the human host. Sporozoites infect liver cells and mature into schizonts, which rupture and release merozoites that infect red blood cells. Ring-stage trophozoites mature into schizonts, which 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.

LIFE CYCLE OF MALARIA

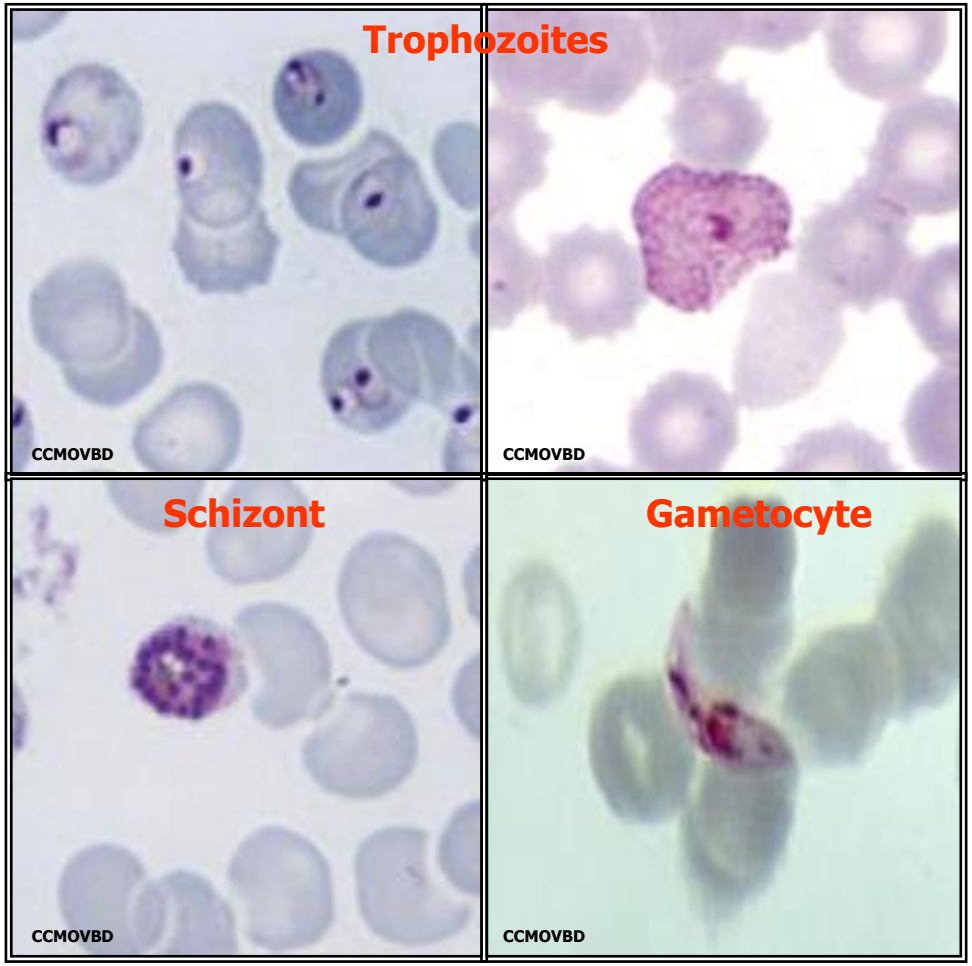


Definition

Severe malaria is defined as symptomatic malaria in a patient with *P. falciparum* with one or more of the following complications:

- **Cerebral malaria *(unrousable coma not attributable to other causes).***
- **Generalized convulsions *(> 2 episodes within 24 hours)***
- **Severe normocytic anaemia *(Ht<15% or Hb < 5 g/dl)***
- **Hypoglycemia *(blood glucose < 2.2 mmol/l or 40 mg/dl)***
- **Metabolic acidosis with respiratory distress *(arterial pH < 7.35 or bicarbonate < 15 mmol/l)***
- **Fluid and electrolyte disturbances**
- **Acute renal failure *(urine <400 ml/24 h in adults; 12 ml/kg/24 h in children)***
- **Acute pulmonary edema and adult respiratory distress syndrome**
- **Abnormal bleeding**
- **Jaundice**
- **Haemoglobinuria**
- **Circulatory collapse, shock, septicaema (algid malaria)**
- **Hyperparasitaemia (≥*10% in non-immune; ≥20% in semi-immune)***

The Malaria Parasite



Three developmental stages seen in blood films:

1. Trophozoite
2. Schizont
3. Gametocyte

Definition

- ***Uncomplicated malaria is defined as*:**
- Usually human be infected with malarial parasite other than **P.falcibrum.** Symptomatic infection with malaria parasitemia without signs of severity and/or evidence of vital organ dysfunction.

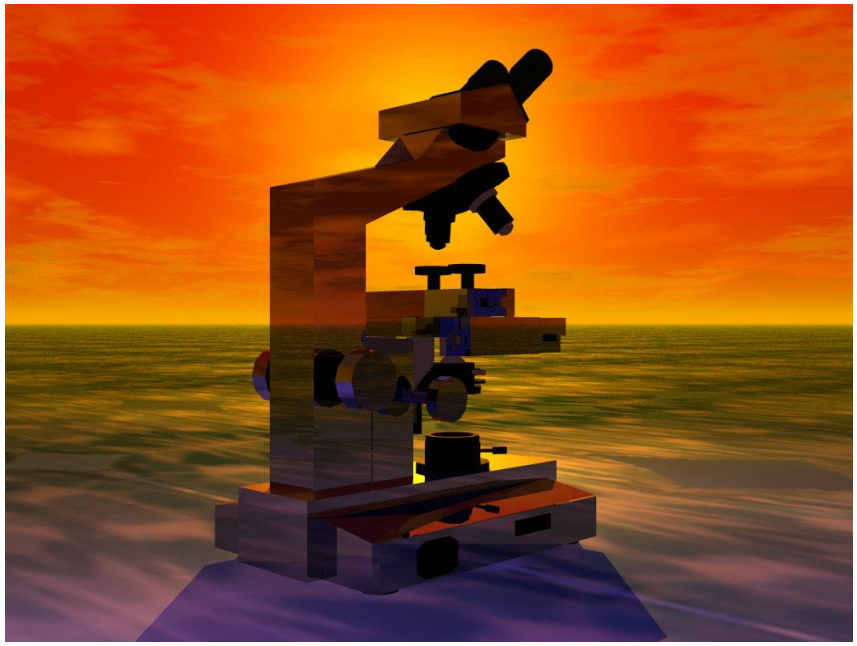
Replace *can* occur when human is infected with **P.vivax** **or** **P.ovale** due to presence of **hypnozoites** as latent parasite in the liver cells.

Microscopy is the gold standard for diagnosis of malaria

Parasite density

Species diagnosis

Monitoring response to treatment



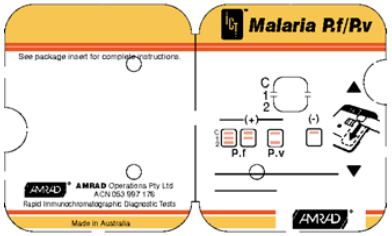
Thin film **Thick film**

Laboratory diagnosis of malaria

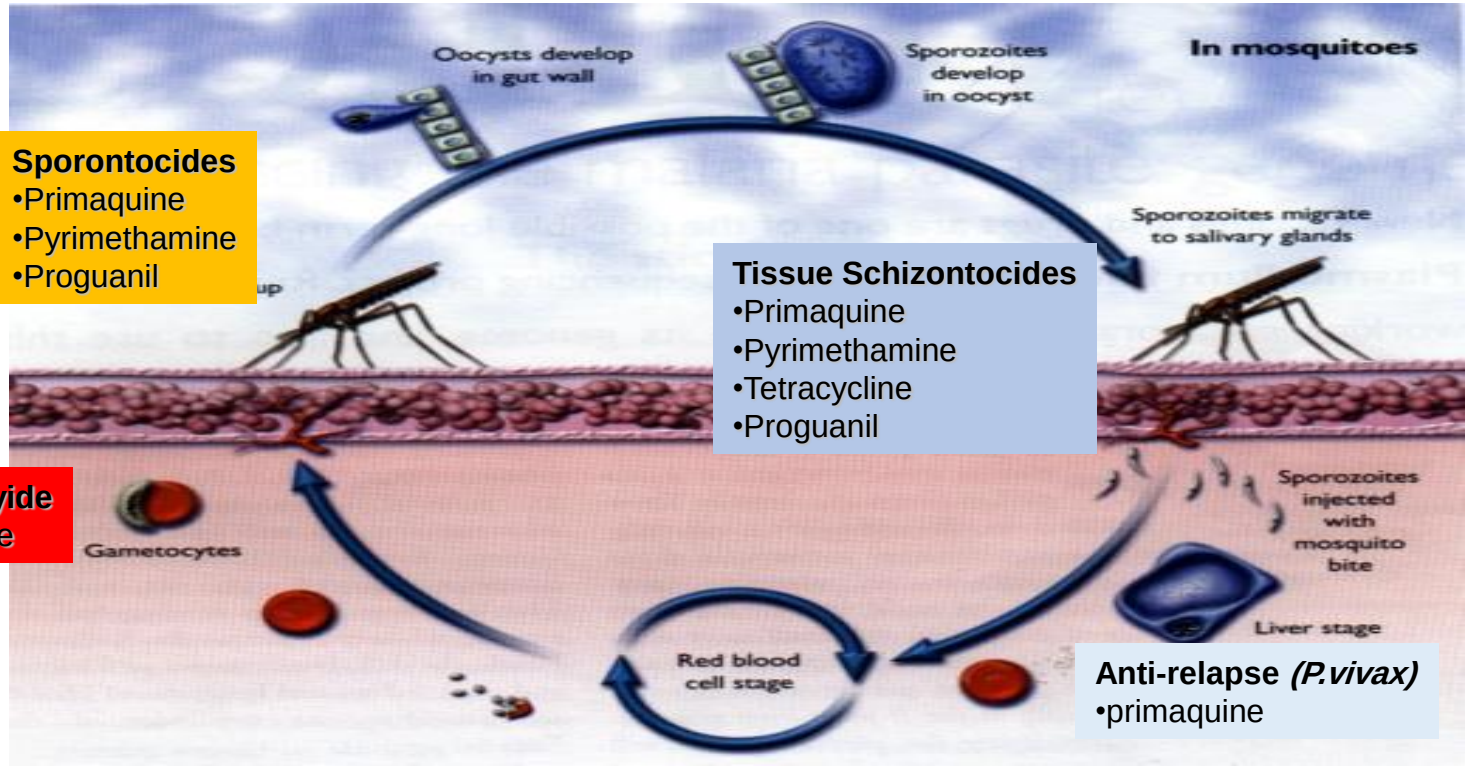
Rapid diagnostic tests detect malaria antigens

The products come in a number of formats:

- Plastic cassette
- Card
- Dipstick
- Hybrid cassette-dipsticks



ACTION OF ANTIMALARIAL DRUG IN THE DIFFERENT LIFE STAGES OF THE MALARIA PARASITE



Sporontocides
- Primaquine
- Pyrimethamine
- Proguanil

Tissue Schizontocides
- Primaquine
- Pyrimethamine
- Tetracycline
- Proguanil

Gametocyide
Primaquine

Anti-relapse *(P.vivax)*
- primaquine

Blood Schizontocides
- Chloroquine
- Sulfadoxine/Pyrimethamine
- Quinine
- Artemisinins

Wellcome Trust (Modified)

Treatment:
chloroquine, primaquine

Viral hepatitis (B, C, D, G)

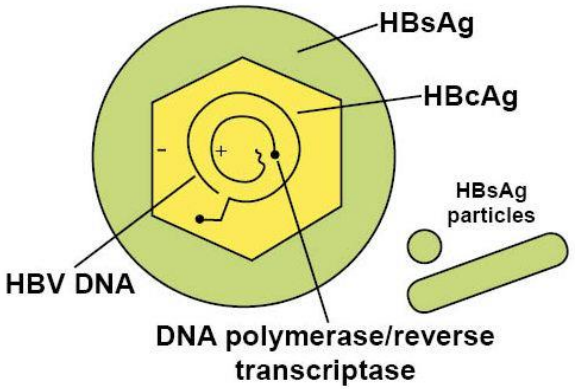
Characteristics of HBV

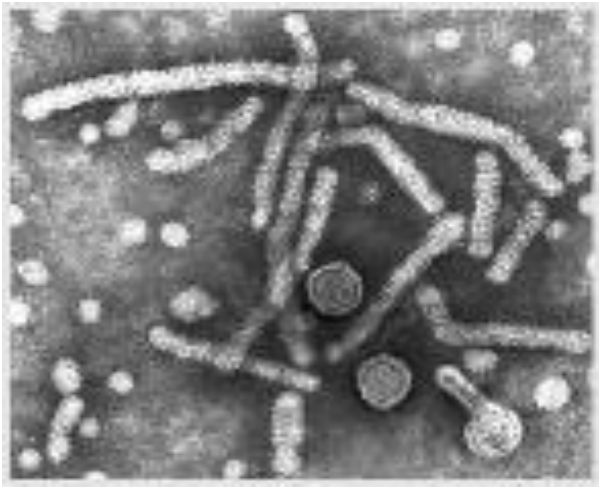
❑ The serum of infected individual contains three types of hepatitis B particles:

➢ Large number of small spherical free HBsAg particles.

➢ Some of these HBsAg particles are linked together to form filaments.

➢ The complete HBV particles (Dane particles).





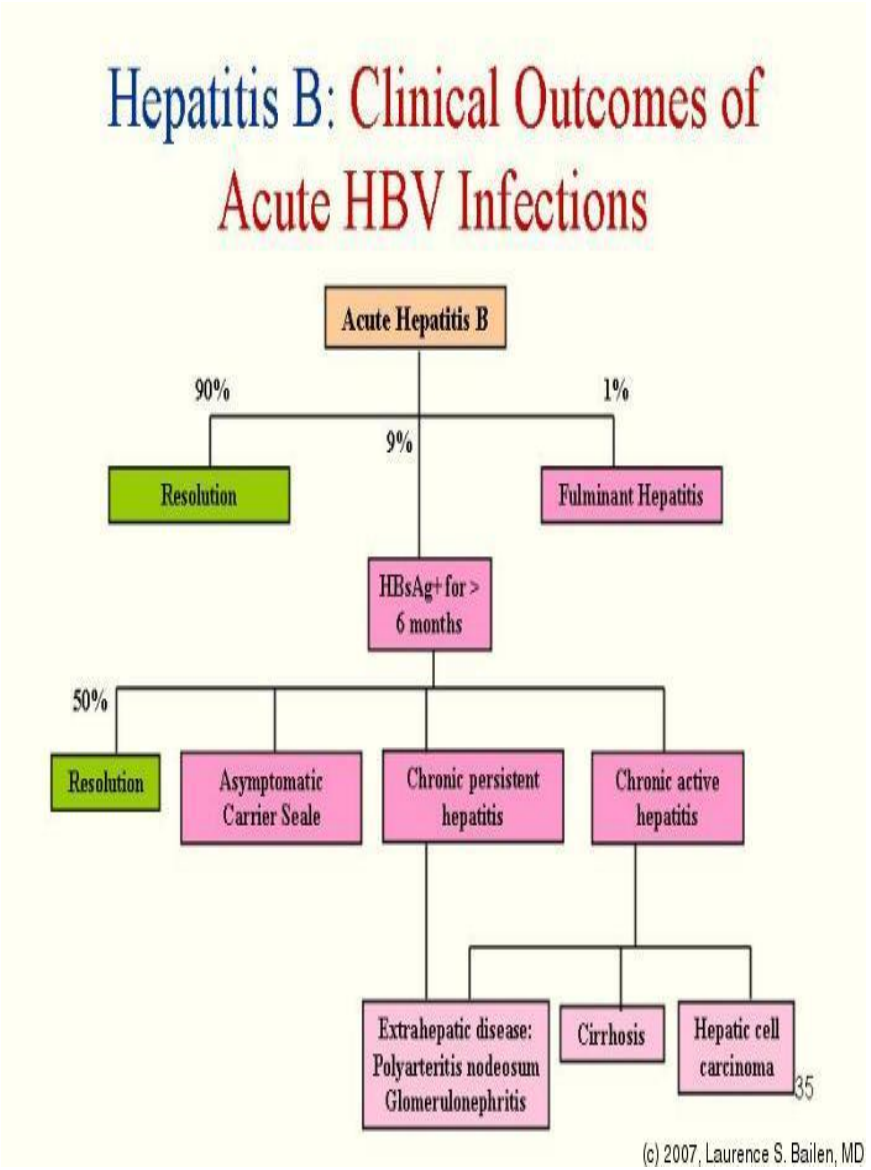
❑ There are 8 known genotypes (A-H), Genotype D is the dominant in Saudi patients.

The clinical outcome of HBV infection

- About **90 %** of infected adults will develop acute hepatitis B infection and recover completely.

- **< 9 % of the infected adult, 90% of infected infants and 20% of infected children may progress to chronic hepatitis B.**

- **< 1 %** may develop fulminant hepatitis B, characterized by massive liver necrosis, liver failure and death..



Transmission of HBV

1- Parentally:

Direct exposure to infected blood or body fluids (e.g. receiving blood from infected donor).

Using contaminated or not adequately sterilized tools in surgical or cosmetic practice (dental, tattooing, body piercing).

Sharing contaminated needles, razors, or tooth brushes.

2- Sexually (unprotected sex):

The virus is present in blood and body fluids. By having sexual contacts with infected person ,virus is present in semen and vaginal secretion.

3- From mother to the fetus :

Mostly(**perinatally**) during delivery ,nursing ,breast feeding and less likely through placenta **(vertical transmission)**

ROUTES OF TRANSMISSION

1) Intravenous drug use:
sharing of needles and syringes
Reuse of contaminated needles

2) Sexual transmission

3) Blood transfusion

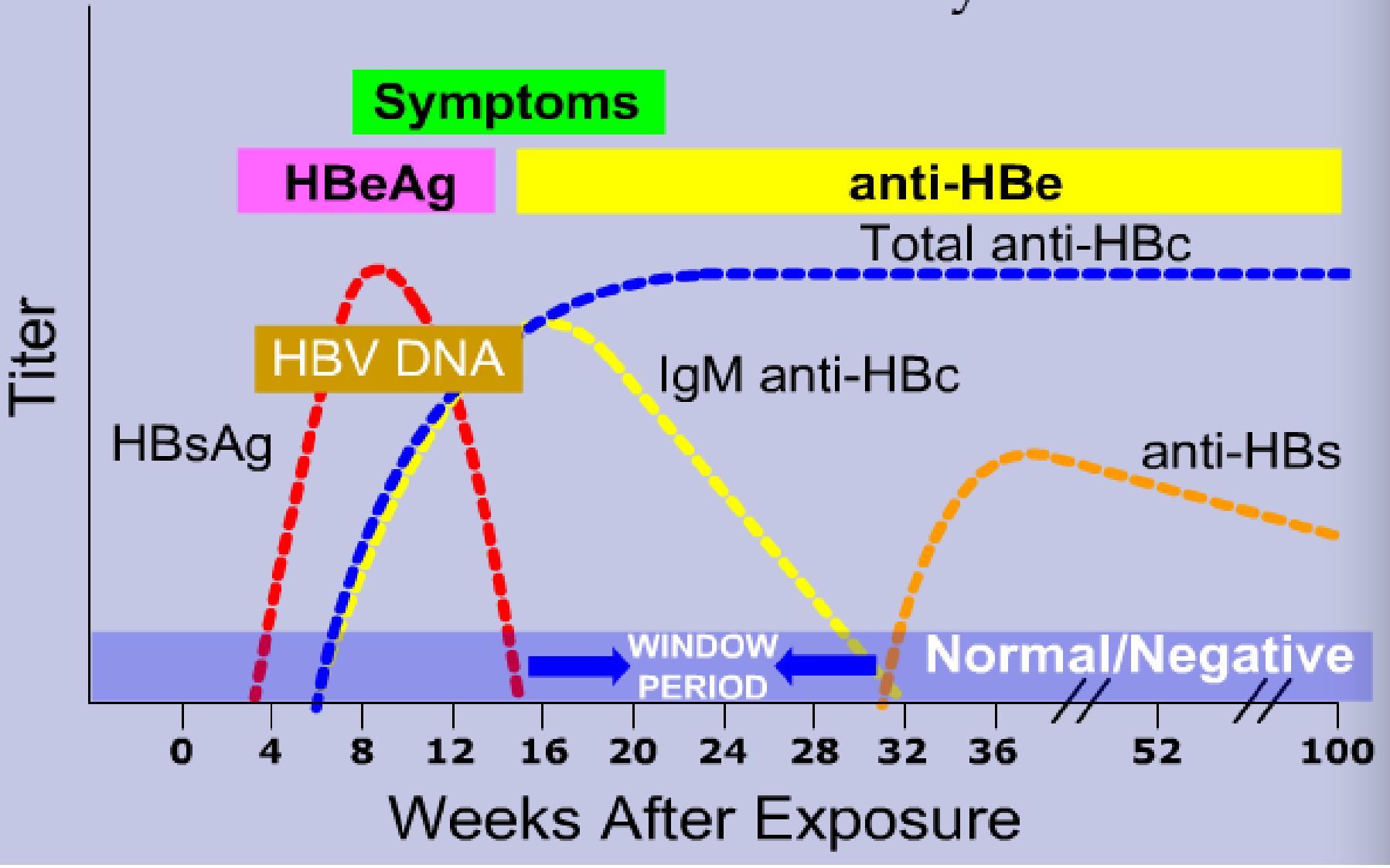
5) Needlestick injury

4) Vertical transmission

Hepatitis B markers

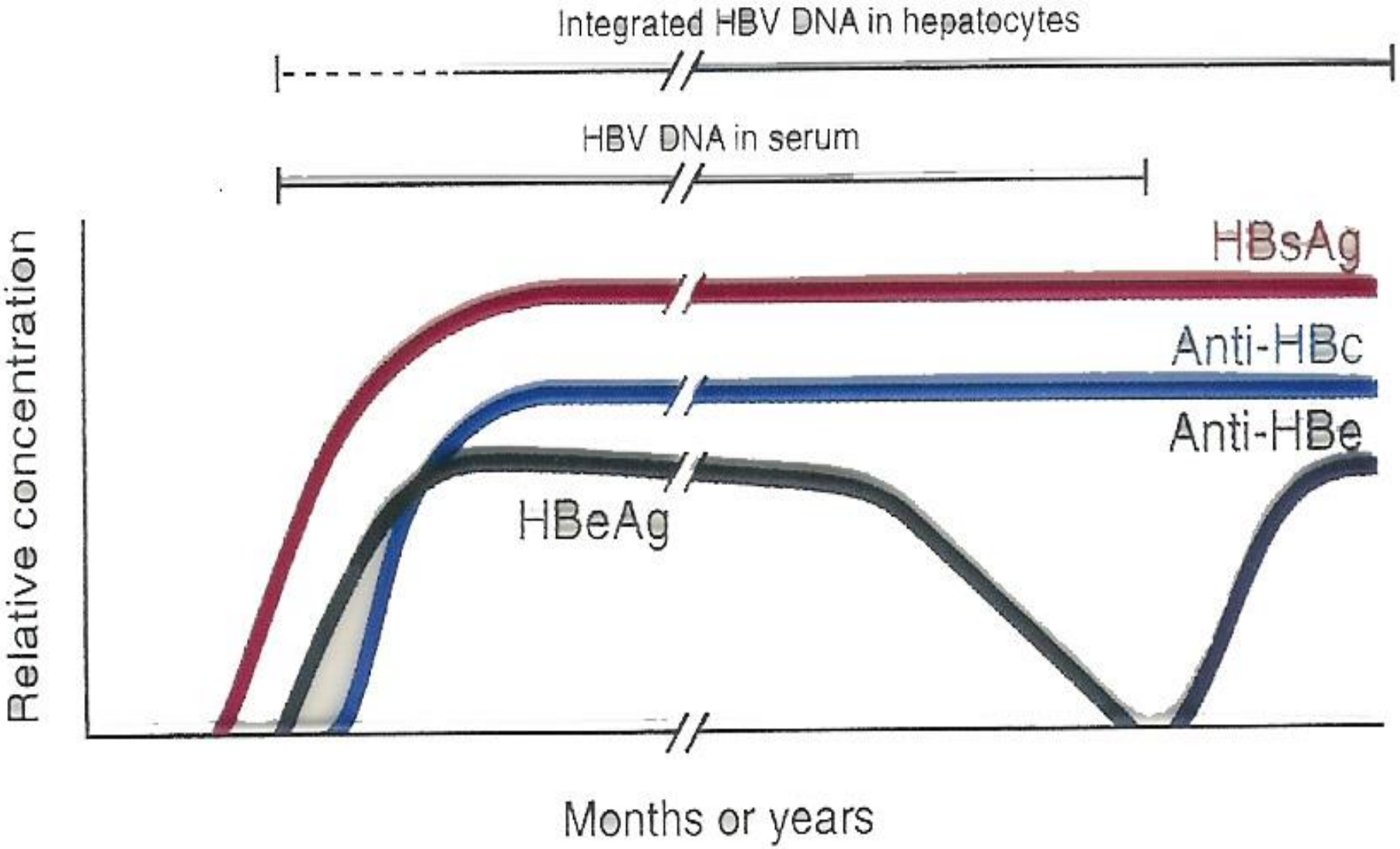
Types	Description
HBV DNA (first marker appear)	Marker of infection, contiguous.
Hepatitis B surface antigen (HBsAg)	Marker of infection, contagious .
Hepatitis B e antigen (HBeAg)	Marker of active virus replication, the patient is highly infectious, the virus is present in all body fluids, highly contiguous.
Antibody to hepatitis B e antigen (Anti-HBe)	Marker of low infectivity, the patient is less infectious, contiguous.
Antibody to hepatitis B core (Anti-HBc)	Marker of exposure to hepatitis B infection,contigous.
Antibody to hepatitis B surface antigen (Anti-HBs)	Marker of immunity.NOT CONTIGOUS.

Acute Hepatitis B Virus Infection with Recovery



		Important for SAQ's
HBsAg **anti-HBc** **anti-HBs**	negative negative negative	Susceptible
HBsAg **anti-HBc** **anti-HBs**	negative positive positive	Immune due to natural infection
HBsAg **anti-HBc** **anti-HBs**	negative negative positive	Immune due to hepatitis B vaccination
HBsAg **anti-HBc** **IgM anti-HBc** **anti-HBs**	positive positive positive negative	Acutely infected
HBsAg **anti-HBc** **IgM anti-HBc** **anti-HBs**	positive positive negative negative	Chronically infected
HBsAg **anti-HBc** **anti-HBs**	negative positive negative	Interpretation unclear; four possibilities: 1. Resolved infection (most common) 2. False-positive anti-HBc, thus susceptible 3. "Low level" chronic infection 4. Resolving acute infection

b) **Serological profile of chronic hepatitis B with seroconversion**



Lab diagnosis of hepatitis B infection

- Hepatitis B infection is diagnosed by detection of HBsAg in the blood.

➢**Positive results must be repeated in duplicate.**

➢Repeatedly reactive results must be **confirmed by neutralization test.**

- Additional lab investigations:

1- Liver function tests (LFT).

2- Ultrasound of the liver.

3- Liver biopsy to determine the severity of the diseases.

Hepatitis B vaccine

It contains highly purified preparation of HBsAg particles , produced by genetic engineering in yeast.

It is not live attenuated nor killed vaccine The vaccine is administered in three doses **IM injection at 0 &1 & 6 months Booster doses may be reacquired after**

3-5 years.

It is safe and give excellent protection

Treatment of hepatitis B infection

➢There are several approved antiviral drugs:

1- **Pegylated alpha interferon**, one injection per week, for 6- 12 months.

2- **Lamivudine**, antiviral drug, nucleoside analogue. One tablet a day for at least one year.

3- **Adefovir**, antiviral drug, nucleoside analogue. One tablet a day for at least one year.

- Treatment is limited to patients having chronic hepatitis B based on liver biopsy.

- Criteria for treatment:

➢Positive for HBsAg

➢Positive for HBV-DNA > 20,000 IU/ml.

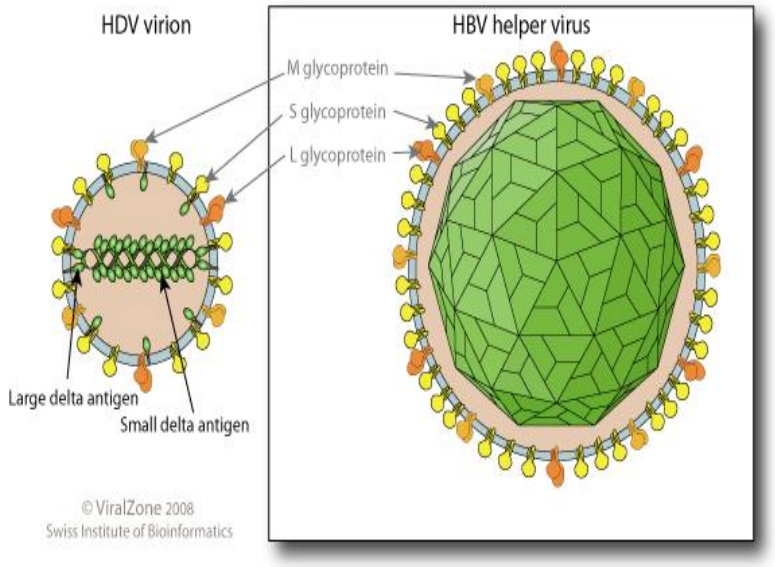
➢ALT > twice the upper normal limit .

➢Moderate liver damage.

➢Age > 18 years.

Hepatitis D virus (delta virus): Structure

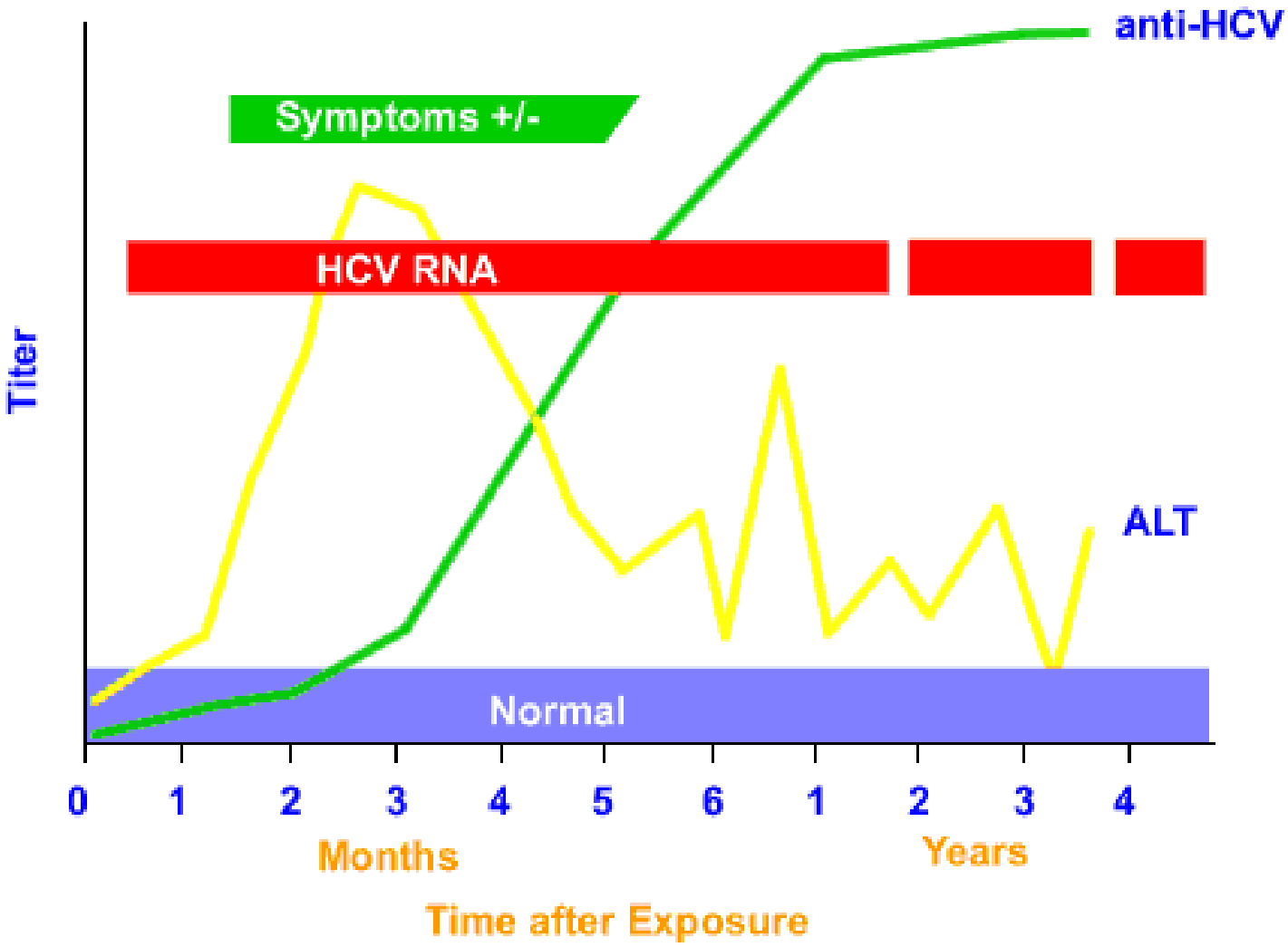
- It is a **defective virus**, that cannot replicates by its own**.**
- It requires a helper virus.
- The helper virus is HBV.
- HBV provides the free HBsAg particles to be used as an envelope.
- HDV is small 30-40 nm in diameter.
- Composed of small ss-RNA genome, surrounded by delta antigen that form the nucleocapsid.

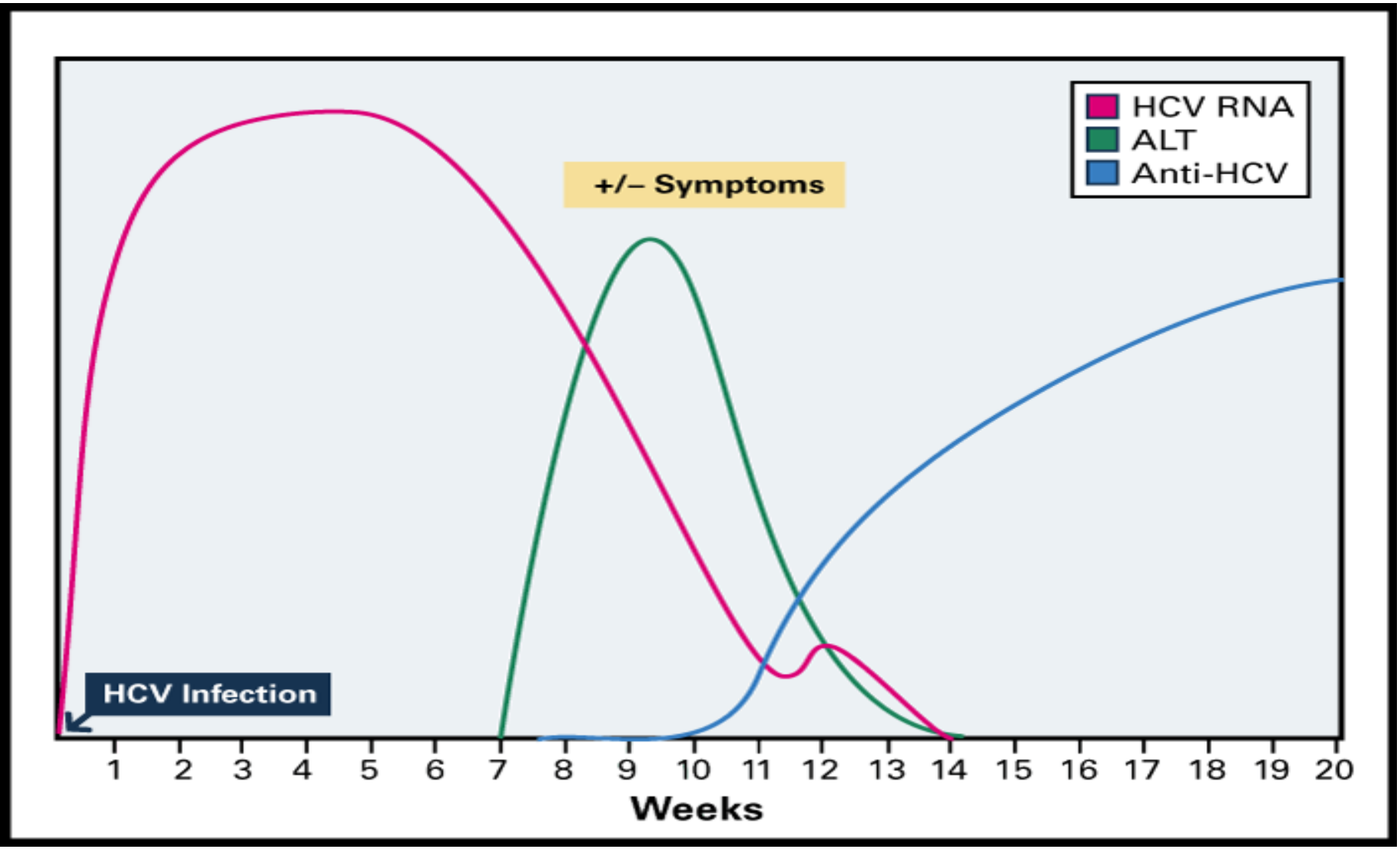


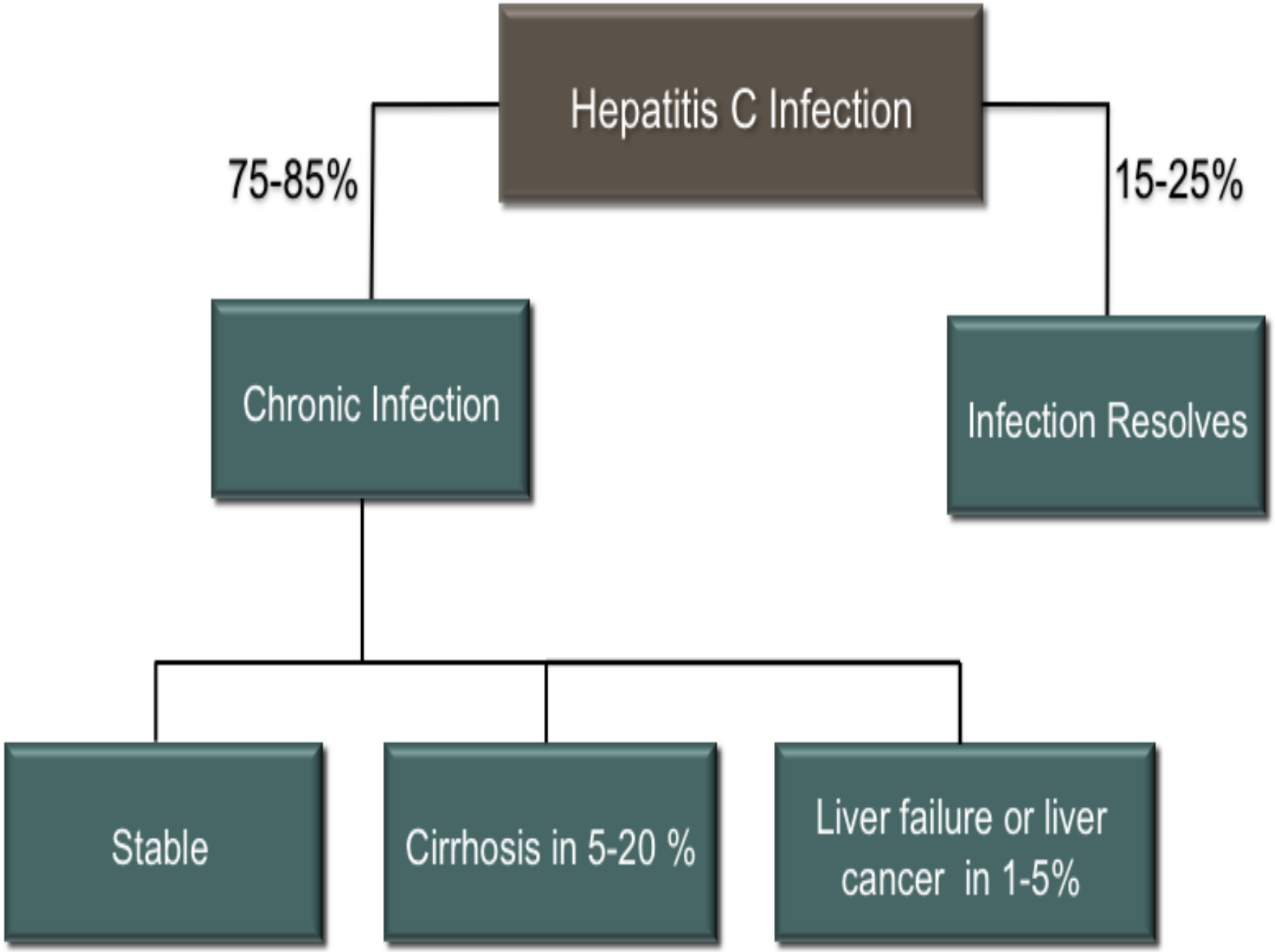
The clinical picture of HCV

- Incubation period from 2 to 7 weeks.
- Clinically ,the acute infection with HCV is milder than infection with HBV.
- Fever ,anorexia, nausea, vomiting , and jaundice are common.
- Dark urine ,pale feces , and elevated liver enzyme (transaminase) are seen.

Serologic Pattern of Acute HCV Infection with Progression to Chronic Infection

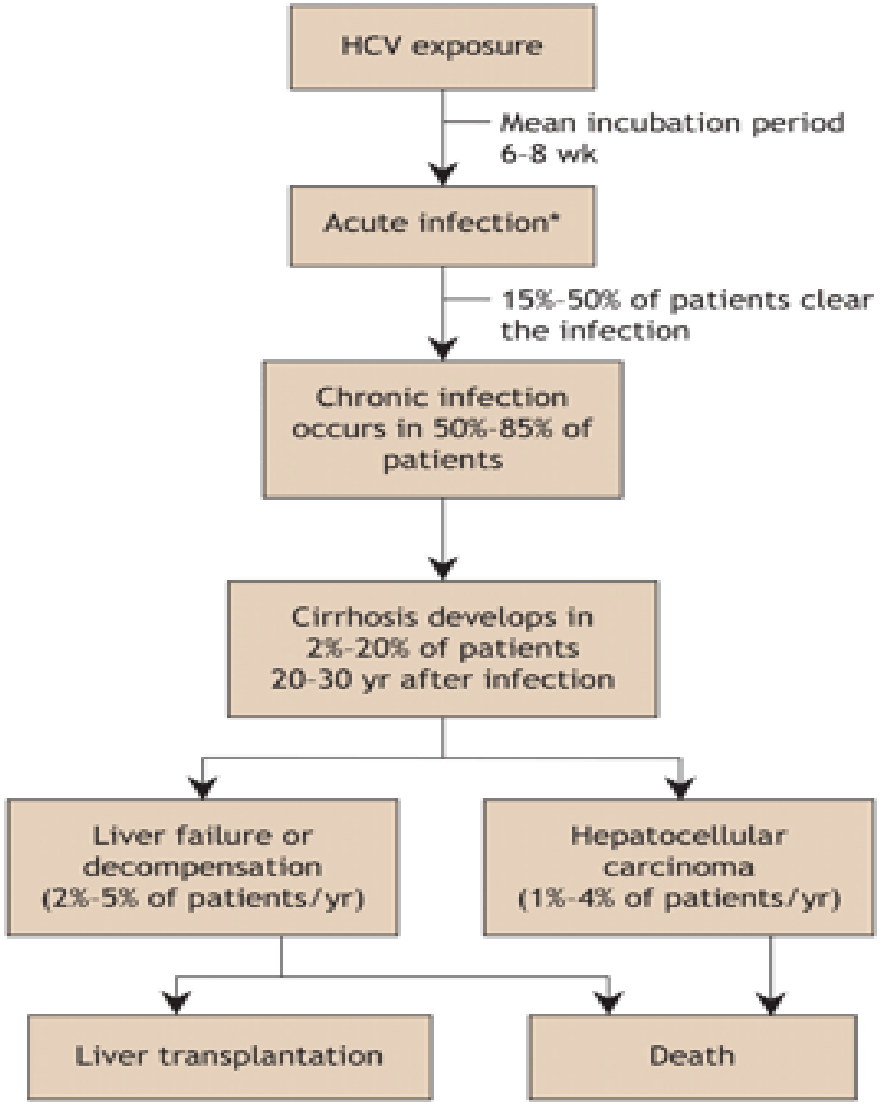



HCV RNA
ALT
Anti-HCV
+/– Symptoms
HCV Infection
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Weeks


Hepatitis C Infection
75-85%
15-25%
Chronic Infection
Infection Resolves
Stable
Cirrhosis in 5-20 %
Liver failure or liver cancer in 1-5%

The clinical outcome of HCV infection

- About 20 % of the infected individuals will develop self-limiting acute hepatitis C and recover completely.
- About 80 % of the infected will progress to chronic hepatitis C.
- < 1 % will develop fulminant hepatitis C, liver failure and death.



Hepatitis C markers

1- Hepatitis C virus RNA.

- Is the 1st marker that appears in circulation, it appears as early as 2-3 weeks after exposure. It is a *marker of infection.*

2- HC Ab antibody .

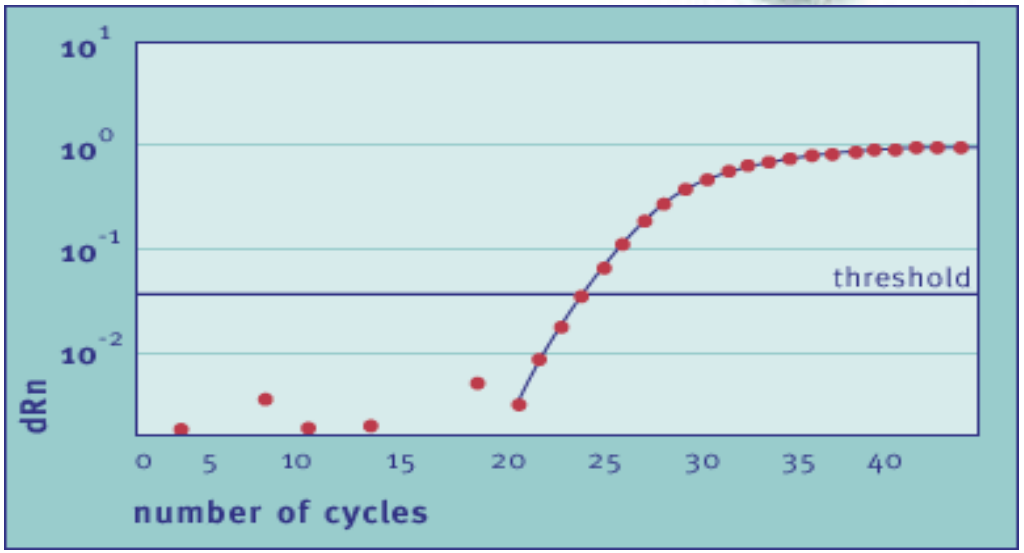
- Antibodies to hepatitis C virus is the second marker that appears in the blood, usually appear 50 days after exposure (long window period), it is not marker of immunity, can be detected in completely recovered patient and chronic and acute.

Lab diagnosis of hepatitis C infection

- **By detection of both:**

1- **Antibody to HCV in the blood by ELISA, if positive we have to repeat it in duplicate ,then, the result must be confirmed by RIBA & PCR.**

2- **HCV-RNA in the blood using PCR.**



Treatment of hepatitis C infection

- The currently used treatment is the combined therapy using: Pegylated alpha interferon and ribavirin.

- The dose: for **pegylated alpha interferon**, one injection per week.
- For **Ribavirine** two capsules a day.
- New treatment for hepatitis C name **SOVALDI(sofosbuvir).**

- Treatment is limited to those positive for HCV-RNA, HCV-Ab, elevated ALT and moderate liver injury based on liver biopsy.

- Criteria for treatment:
- Positive for HCV-RNA.
- Positive for anti-HCV.
- Known HCV genotype.
- ALT > twice the upper normal limit.
- Moderate liver damage based on liver biopsy.

- **No vaccine available to hepatitis C.**

اللهم اني استودعتك ما قرأت وما حفظت وما تعلمت فرد الي عند حاجتي إليه انك على كل شيء قدير