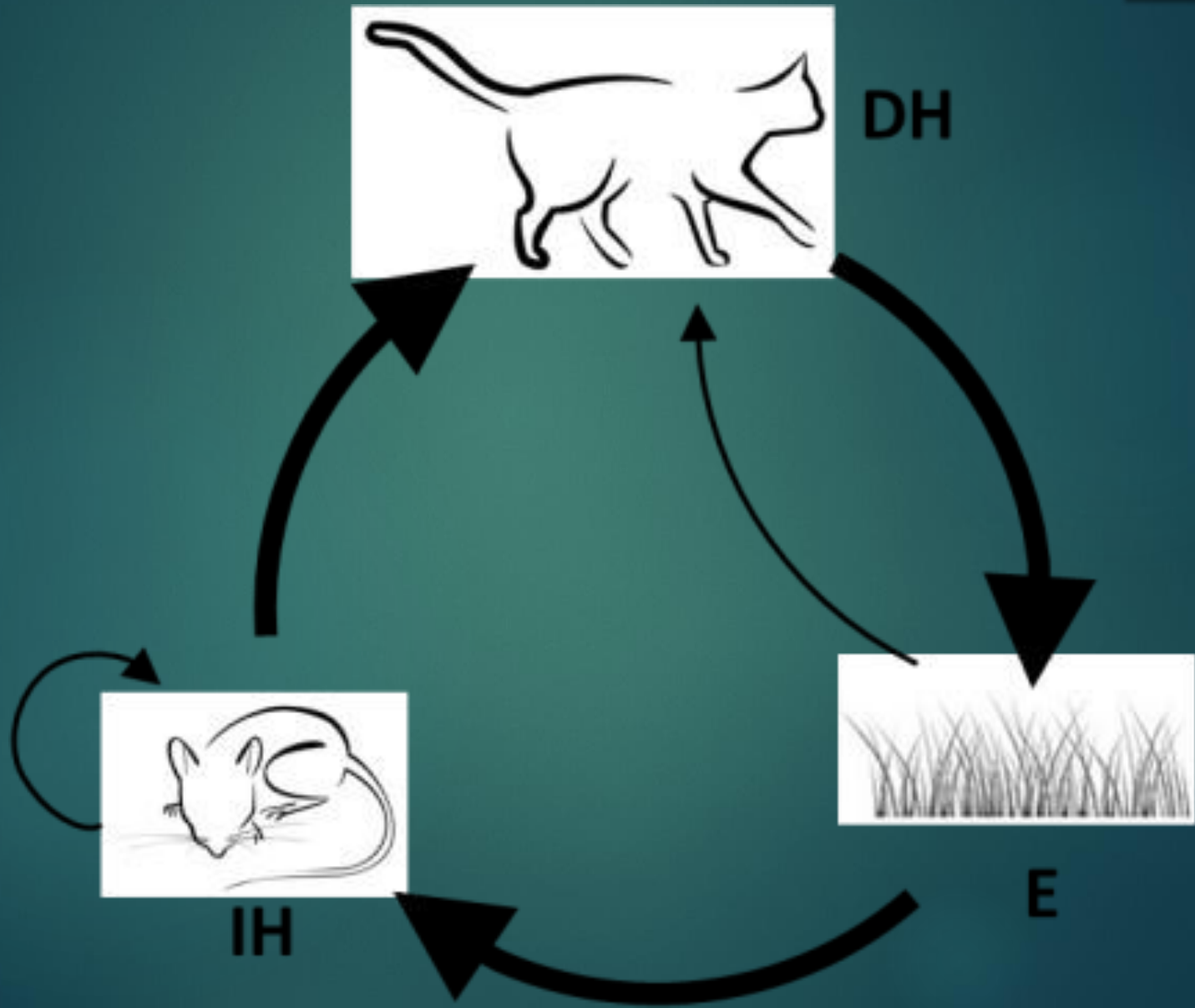


# Parasites

- ▶ **Organisms which are dependent on other organisms for survival**
- ▶ **Eukaryotes**
- ▶ **Unicellular – Protozoa**
- ▶ **Multicellular - Helminths**

- 
- ▶ **Host – organism that provides nutrition to parasite**
  - ▶ **Definitive host – adult stage of parasite is lodged – undergoes sexual reproduction – both males and females are present**
  - ▶ **Intermediate host – harbours larval stage of helminths, asexual reproduction of protozoa**

# For toxoplasma



# PROTOZOA

# Protozoa

- ▶ **Classified according to organ of motility**
- ▶ **Pseudopodia – amoeba**
- ▶ **Cilia – ciliates**
- ▶ **Flagella – flagellates**
- ▶ **Sporozoa (non motile)**



▶ **Amoeba**

☐ **E histolytica, N. fowleri**

▶ **Flagellates**

☐ **Giardia**

☐ **T. vaginalis**

☐ **Leishmania**

▶ **Sporozoa**

☐ **Plasmodium**

☐ **Toxoplasma**

▶ **Ciliates**

☐ **B. coli**

# Classification according to site of infection

## ▶ Intestine

☐ **E histolytica**

☐ **G. lamblia**

## ▶ Genital tract

☐ **T. vaginalis**

## ▶ Blood

☐ **Plasmodium**

☐ **L. donovani**

# Entamoeba Histolytica






# Entamoeba Histolytica

- ▶ **Distribution**
- ▶ **Location**
- ▶ **Life cycle**
- ▶ **Diseases caused**
- ▶ **Pathogenesis**
- ▶ **Lab diagnosis**
- ▶ **Treatment**

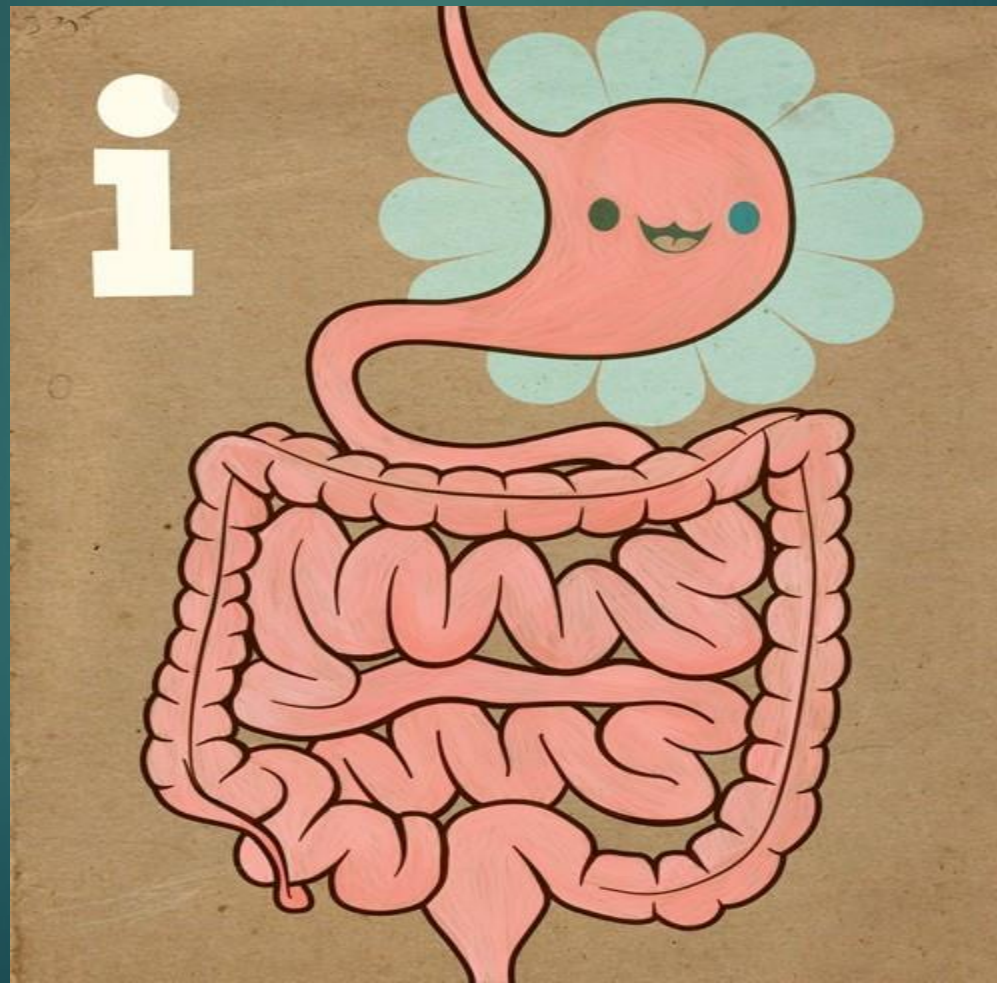
# Distribution


▶ **World wide**

- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**

# Location

- ▶ **Parasite found in large intestine**



- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**

# Life cycle

- ▶ **Entire life cycle completed in one host - humans**

# Morphological forms

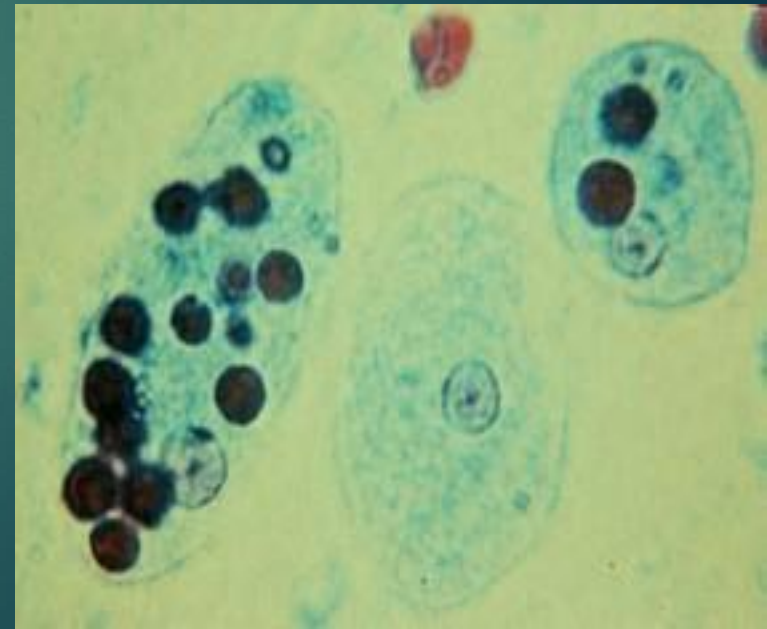
## ► Cysts

- ❑ Round, 10-15 microns
- ❑ 4-6 microns nucleus
- ❑ Highly refractile cyst wall
- ❑ Four or more nuclei



# Trophozoites

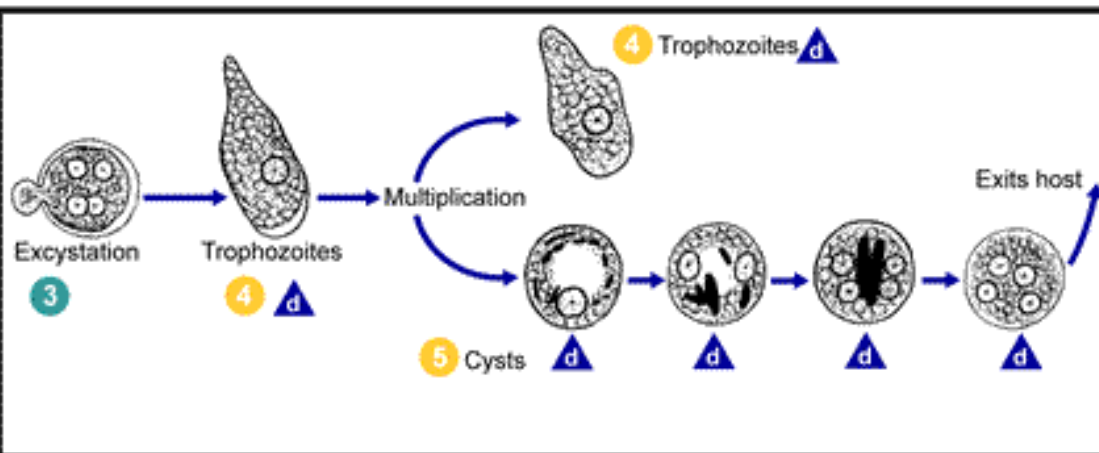
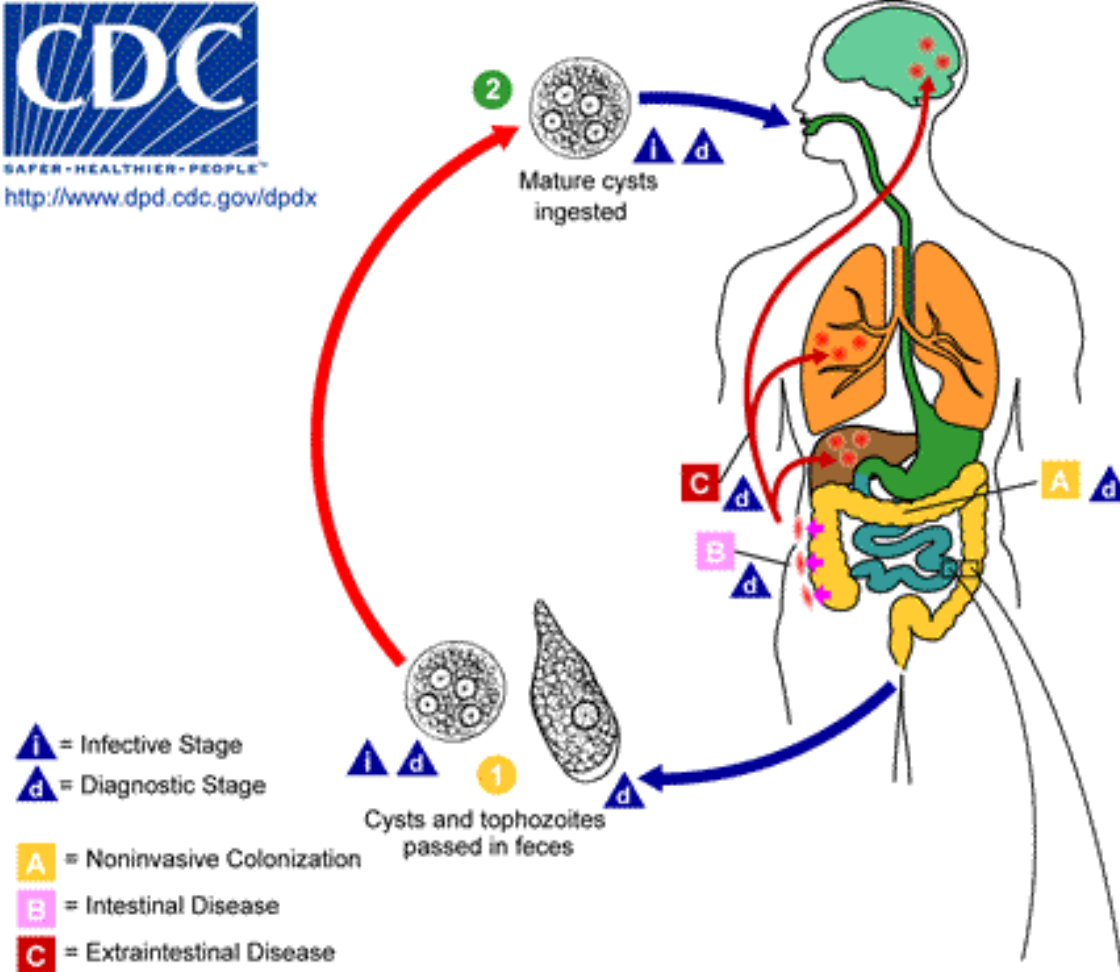
- ▶ **18-40 microns**
- ▶ **Cytoplasm – outer ectoplasm, inner endoplasm**
- ▶ **Nucleus – 4-6 microns**
- ▶ **Ingested red blood cells**








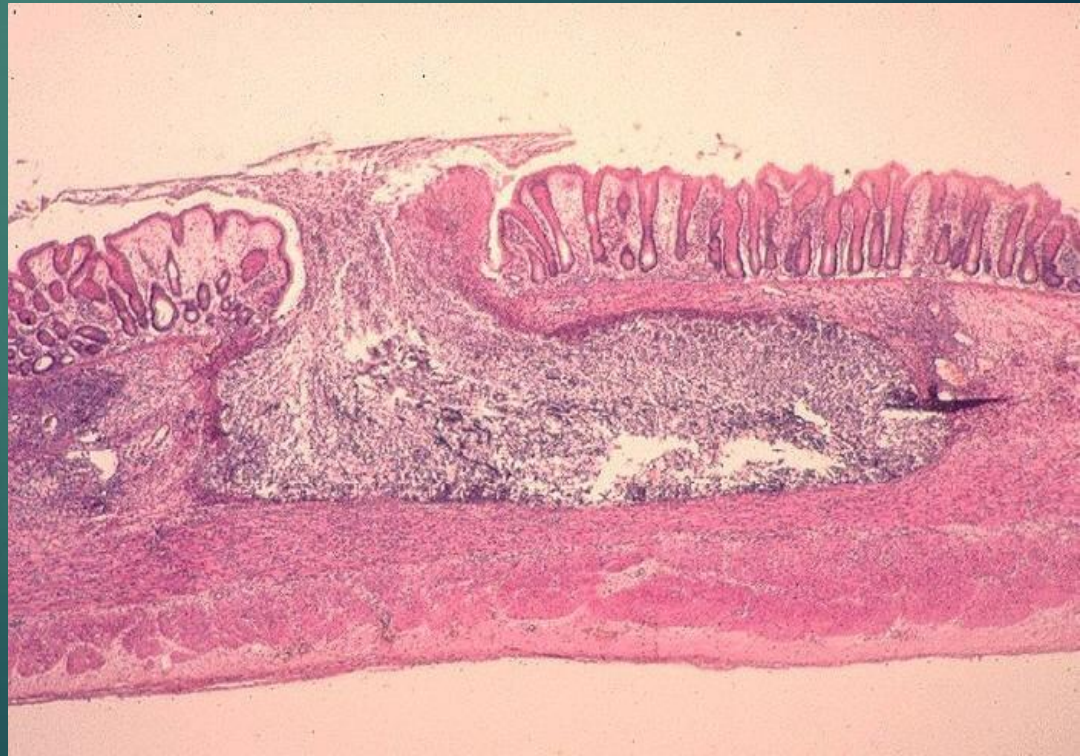
SAFER • HEALTHIER • PEOPLE™  
<http://www.dpd.cdc.gov/dpdx>



- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**

# Diseases caused


- ▶ **Dysentery - Trophozoites burrow into intestinal wall and cause dysentery with ulcers**



## ▶ Extra intestinal manifestations

- ❑ Amebic hepatitis
- ❑ Infection of lungs/brain



- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**

# Lab diagnosis

## ▶ Dysentery

- ❑ Examine freshly passed stools or ulcer scrapings for trophozoite forms
- ❑ Iodine mount for cysts

## ▶ Amoebic hepatitis


- ❑ Liver aspiration



## ▶ Serological tests

❑ ELISA

❑ IHA

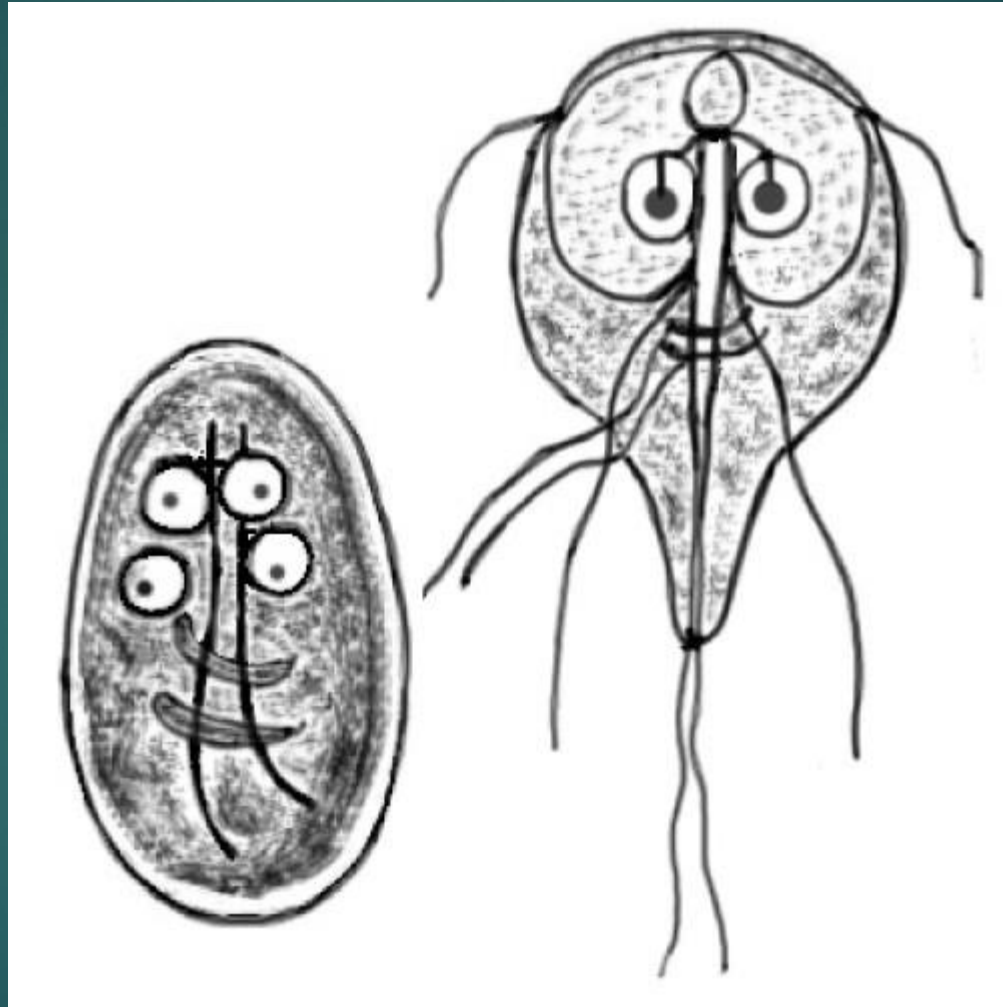
- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**




# Treatment

## ▶ **Metronidazole**


# Giardia Lamblia



- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**

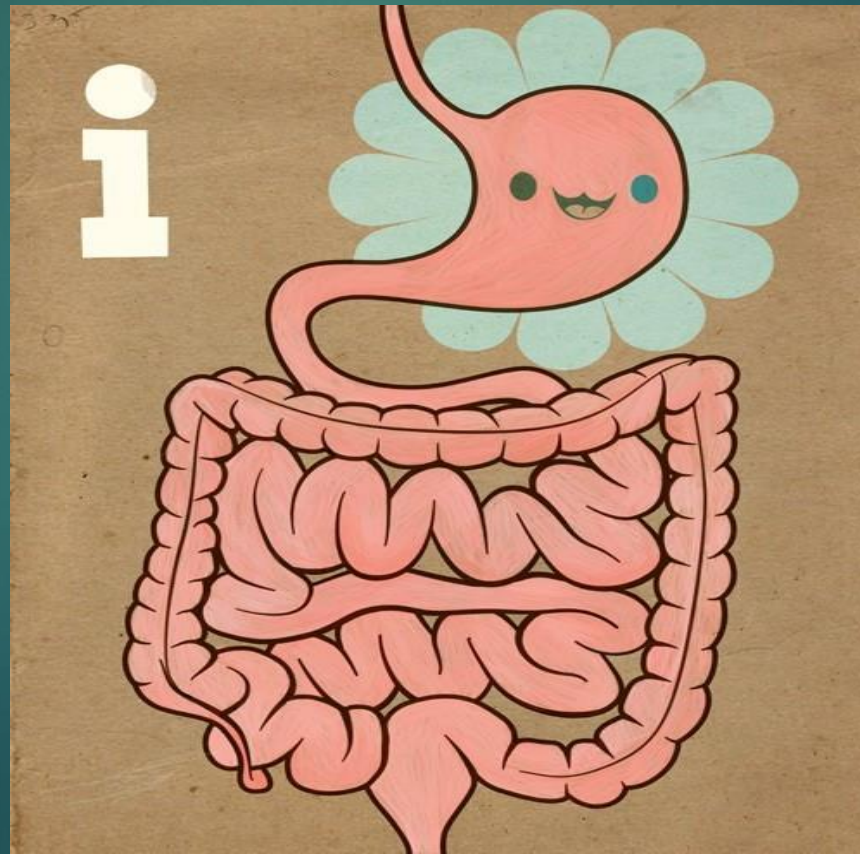
# Distribution


▶ **World wide**

- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**

# Location

- ▶ **Small intestine – duodenum and upper part of jejunum**



- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**

# Life cycle

- ▶ **Entire life cycle is completed in one host - humans**



# Morphologic forms

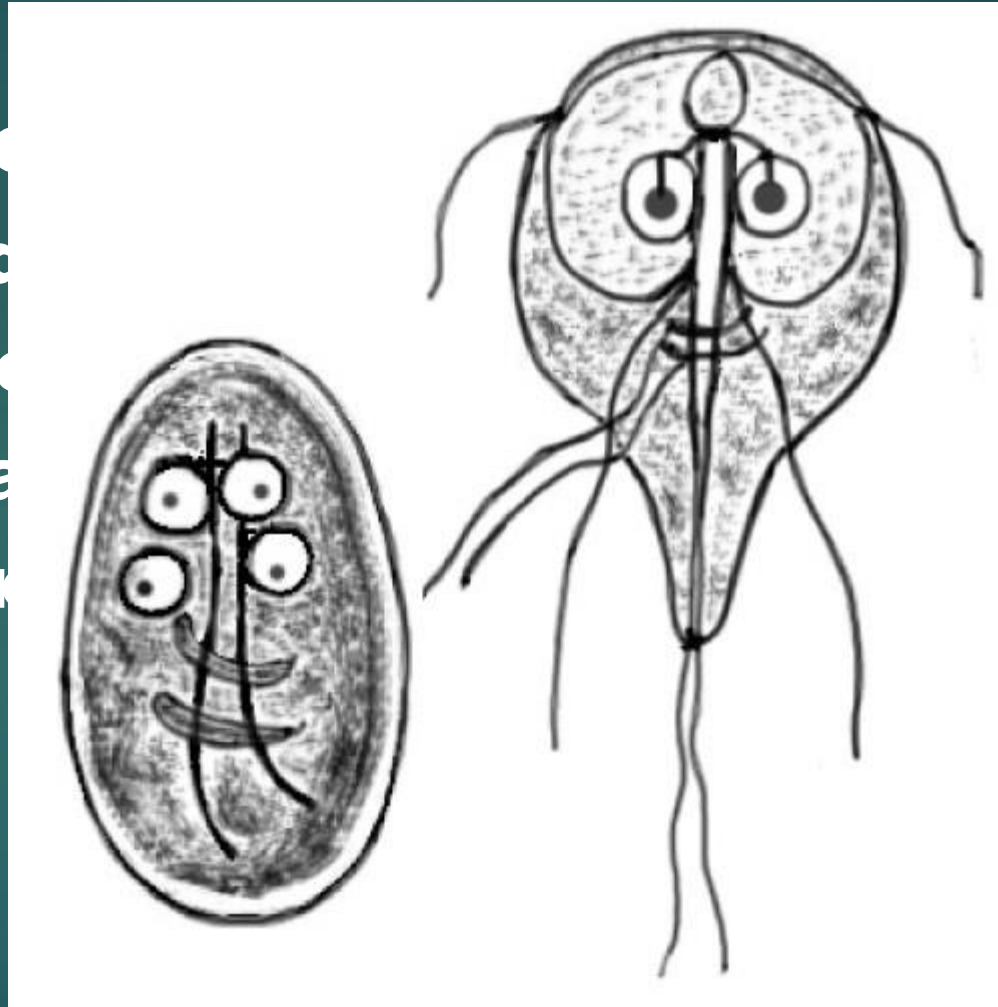
## ► Trophozoite

? Shaped

? Two suckers

? Bilateral

? Two nuclei



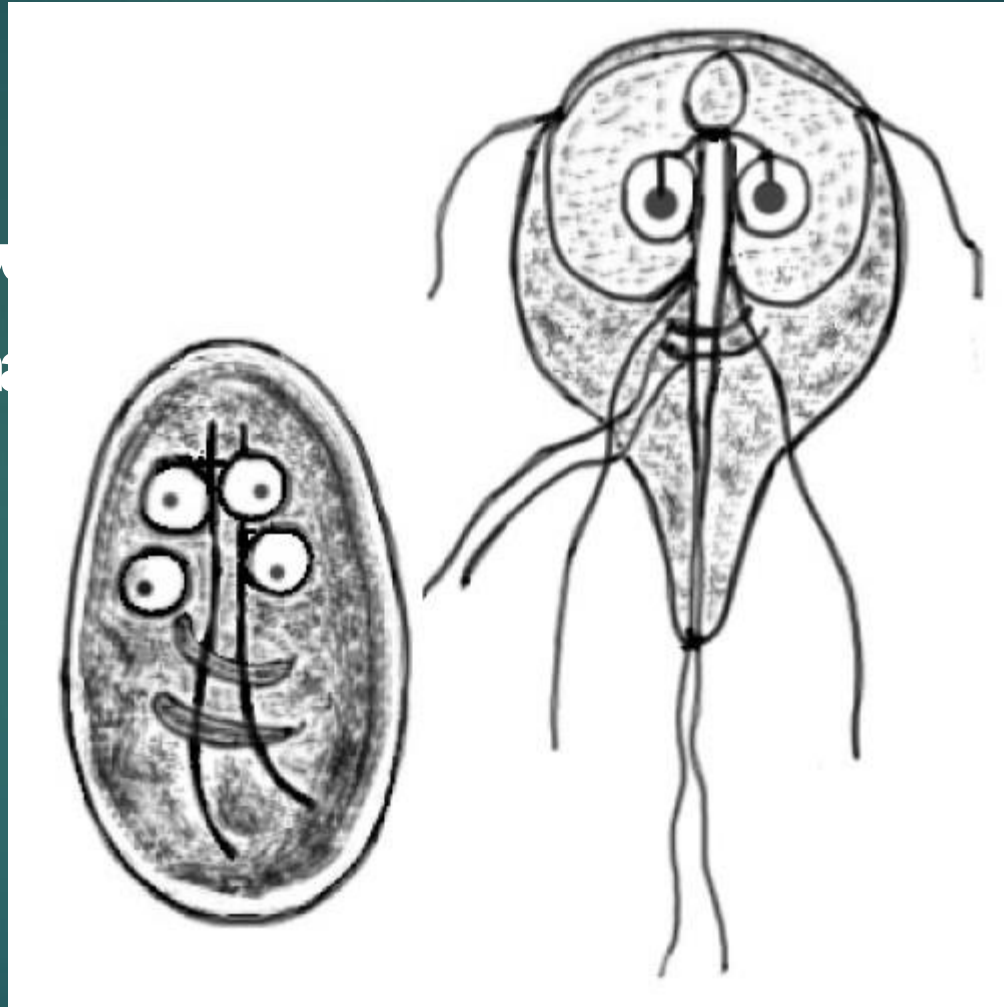
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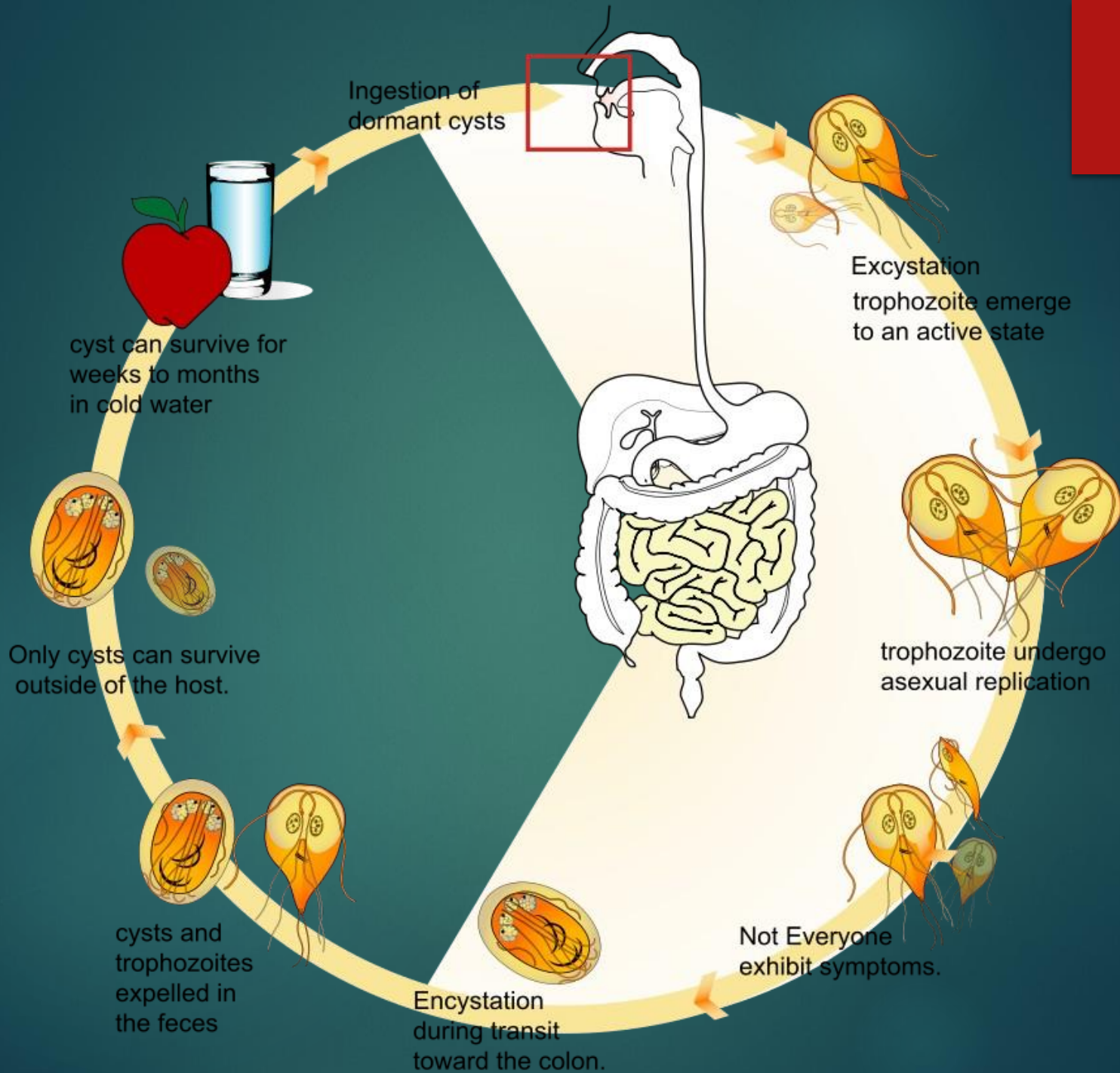
ella


## ► Cyst

☐ Infective

☐ Egg shape





- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**


# Diseases caused

- ▶ **steatorrhoea – excessive fat in stools**

- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**

# Pathogenesis


- ▶ **Steatorrhoea is due to malabsorption of fat**
- ▶ **Disease is never invasive – no dysentery**

- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**



# Lab diagnosis

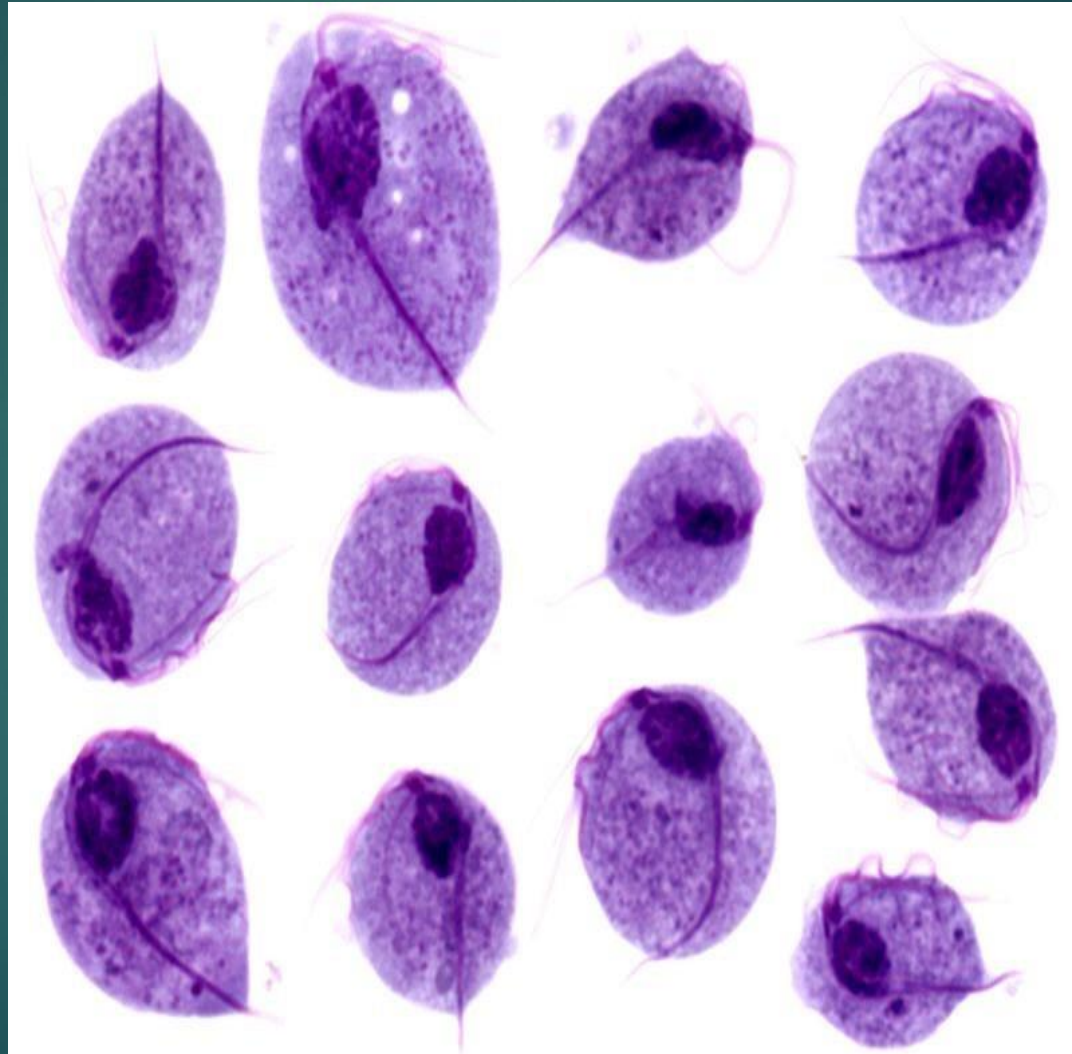
- ▶ **Demonstration of cysts and trophozoites in stool**


- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**

# Treatment

## ▶ **Metronidazole**


# Trichomonas Vaginalis



- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**

# Distribution


▶ **World wide**

- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**

# Location

## ▶ Female genital tract



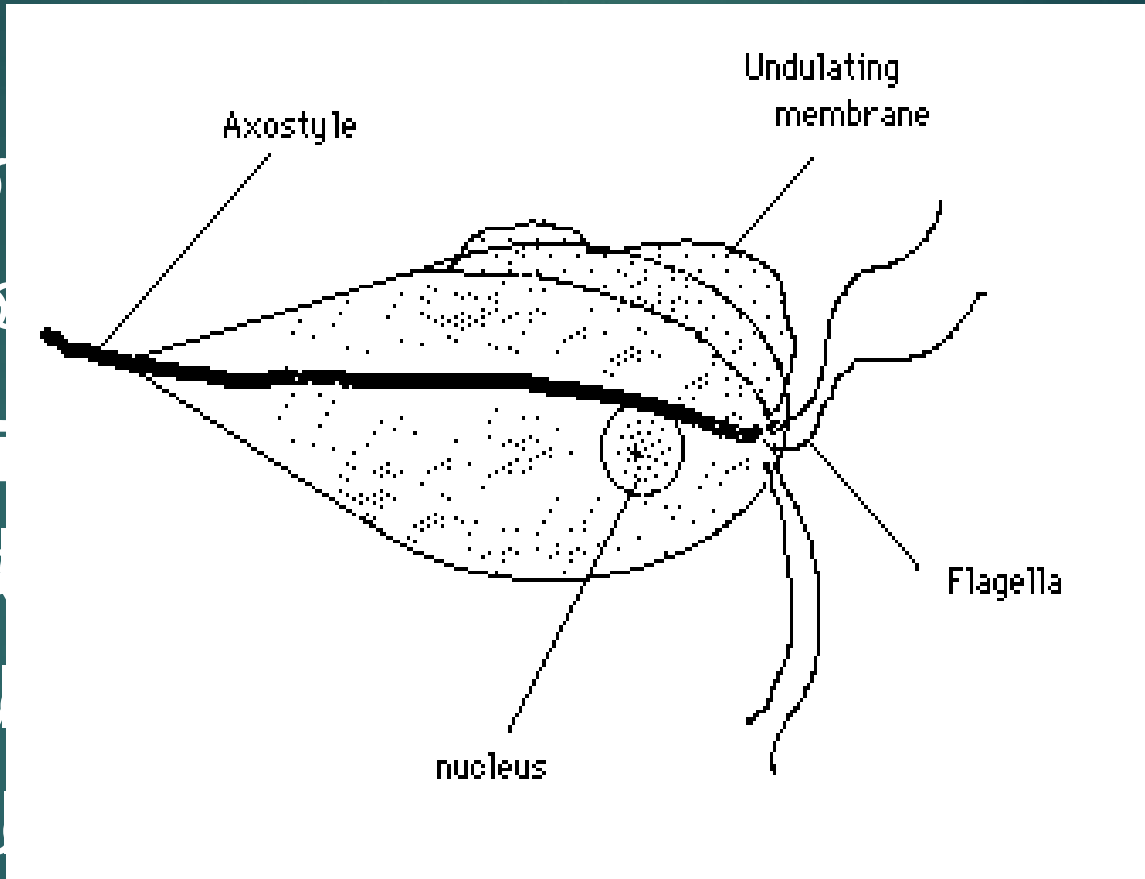
- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**

# Life cycle

- ▶ **Human beings are the only host**

# Morphological forms

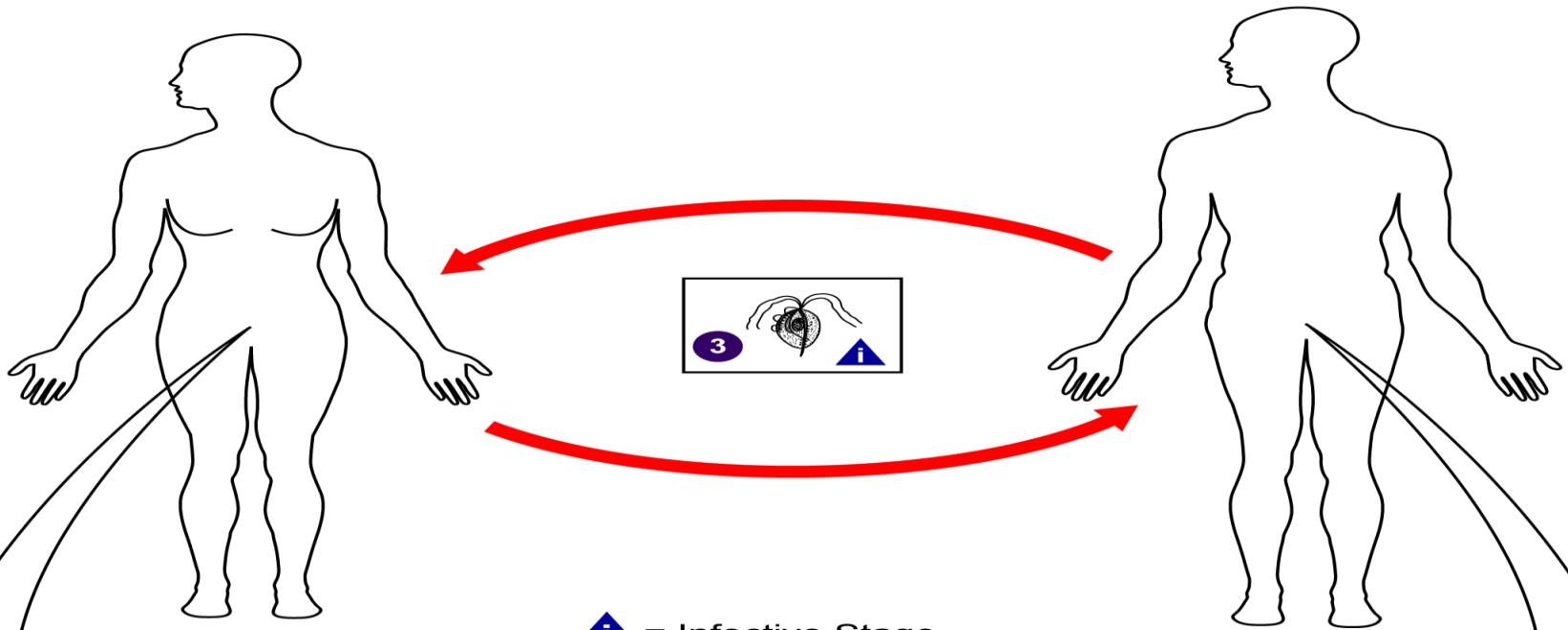
- ▶ Only one
- ▶ Pear-shaped
- ▶ Single
- ▶ 3-5 pairs
- ▶ One
- ▶ One
- ▶ reduced



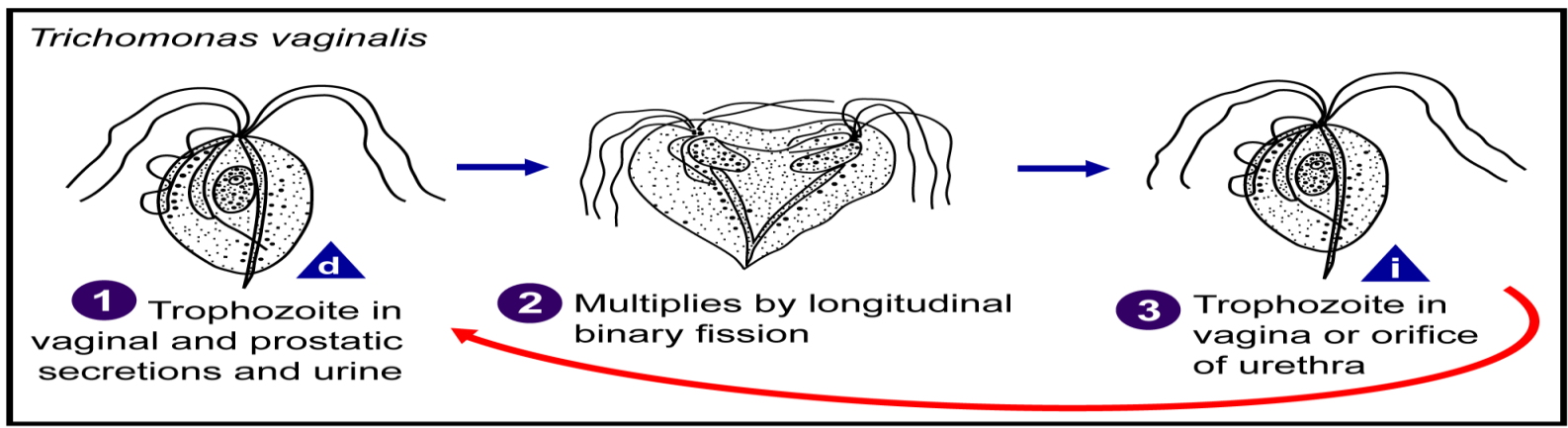
agella


# Trichomoniasis

*(Trichomonas vaginalis)*




**i** = Infective Stage  
**d** = Diagnostic Stage



- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**

# Diseases caused

- ▶ **Trichomoniasis in females which is a sexually transmitted disease – presents as UTI**
- ▶ **In males - urethritis**


- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**

# Lab diagnosis

- ▶ **Demonstrate organism in vaginal discharge from females and urethral discharge from males**
- ▶ **Saline preparation shows characteristic corkscrew motility**

Please see the link <https://www.youtube.com/watch?v=9B1PFJXuJUs> for motility



- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**

# Treatment

- ▶ **Metronidazole to both partners**

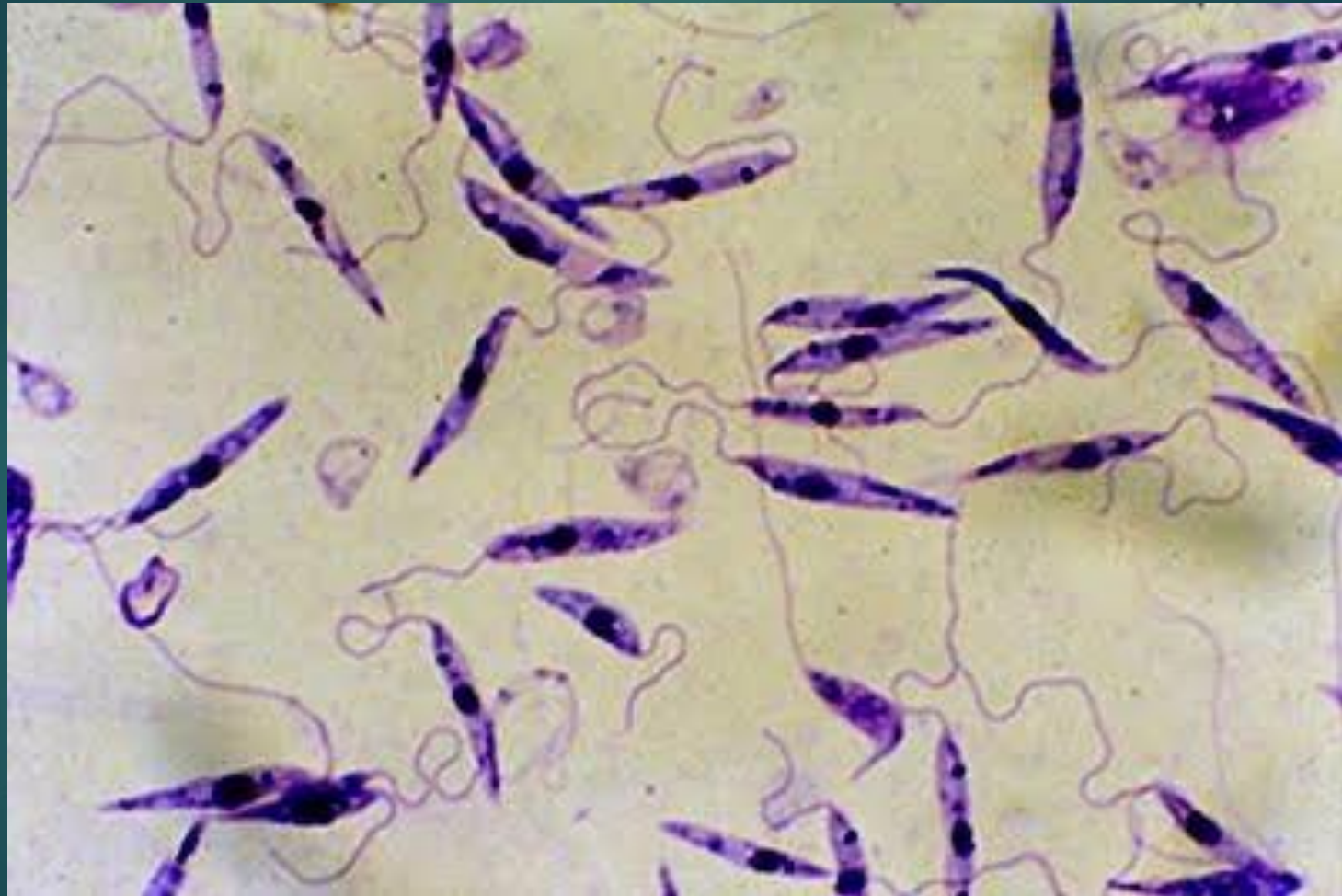



# HAEMOFLAGELLATES

**Leishmania**

**Plasmodia**

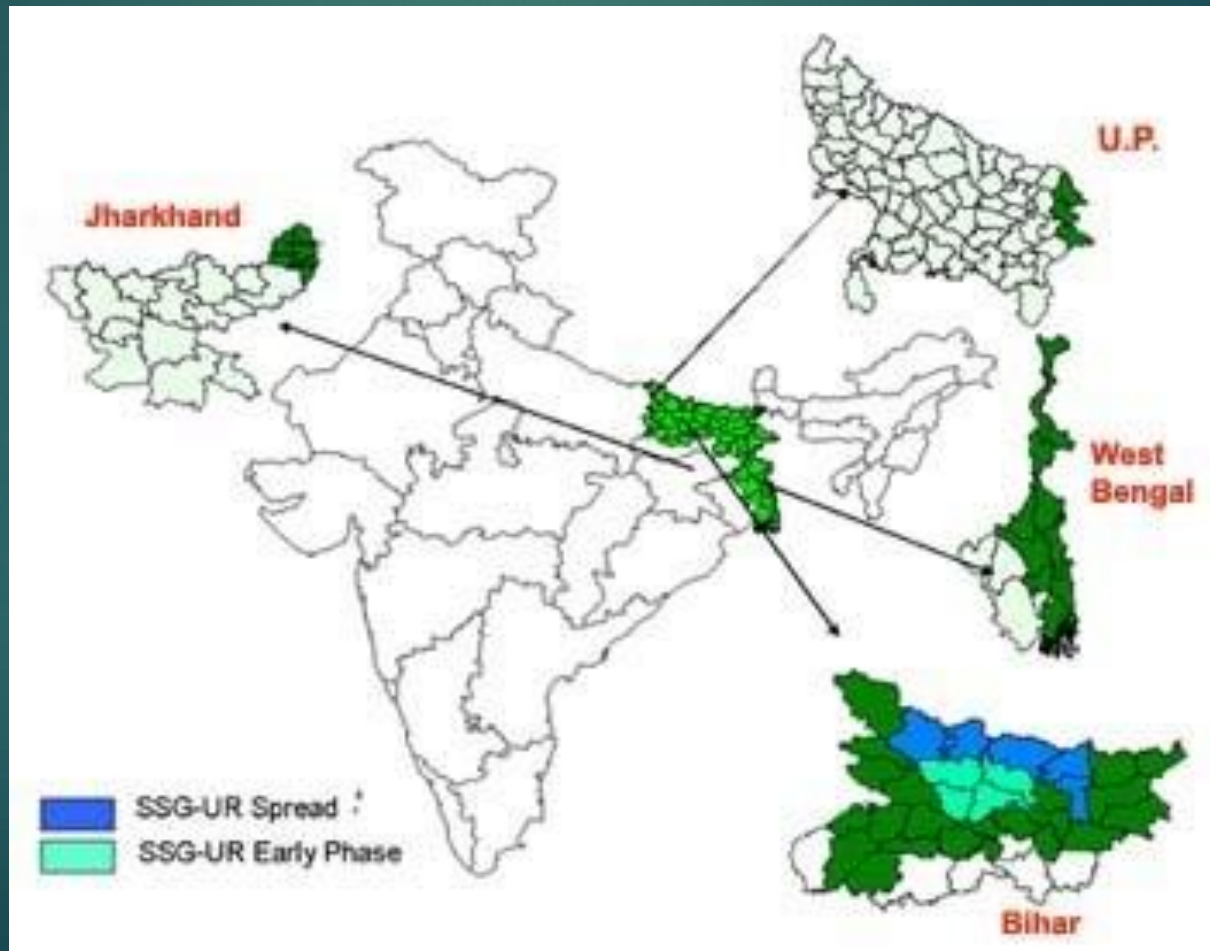
# Leishmania Donovanani




- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**

# Distribution

## ► India - endemic



- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**

# Location


## ▶ **Reticuloendothelial system**

❑ **Bone marrow**

❑ **Liver**

❑ **Spleen**



- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**

# Life cycle

## ▶ **Two hosts**

- ❑ **Humans – definitive host (sexual reproduction)**
- ❑ **Sandfly – intermediate host (asexual reproduction)**

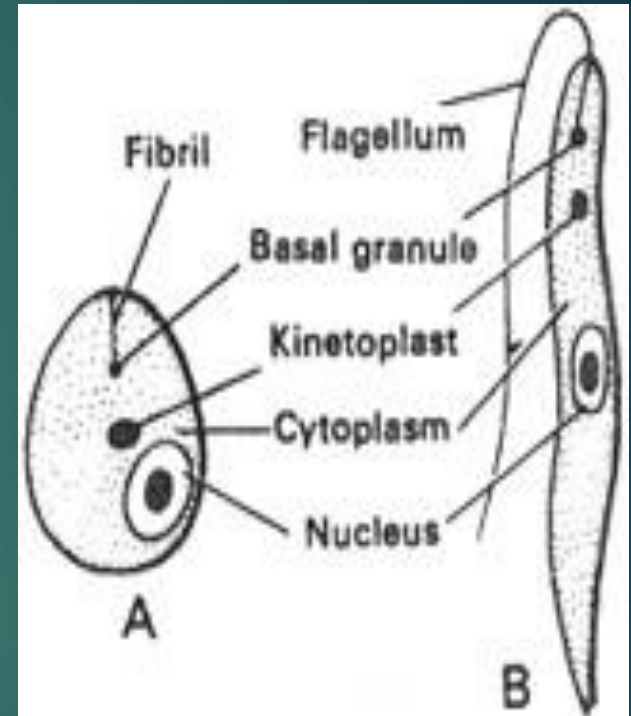
# Morphologic forms

## ► Promastigote stage –

- ❑ Stage with flagella
- ❑ Nucleus in centre
- ❑ One kinetoplast at anterior end
- ❑ Flagella at anterior end

## ► Amastigote stage –

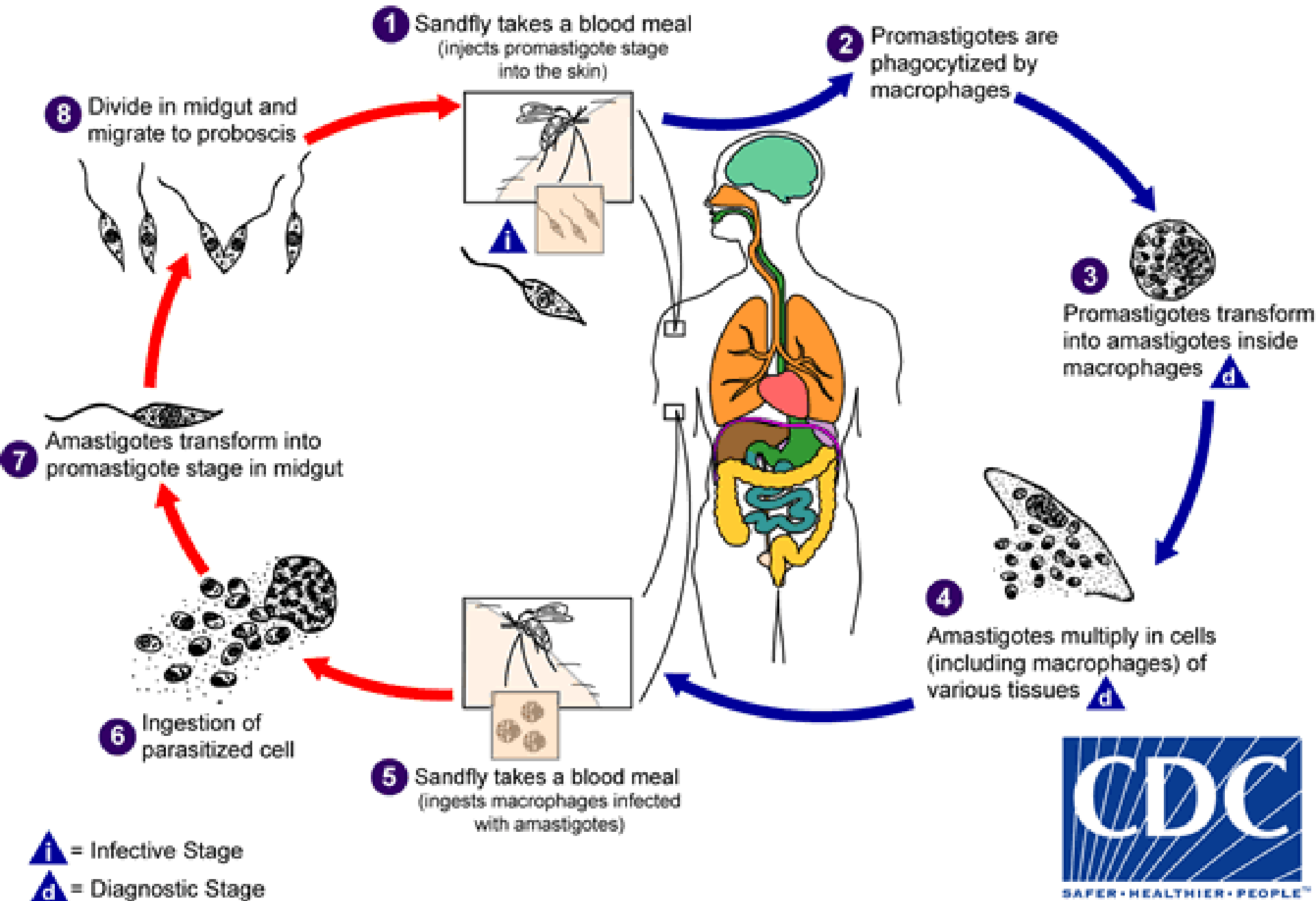
- ❑ Seen in humans
- ❑ Egg shaped
- ❑ Nucleus at centre
- ❑ Kinetoplast at right angle




*Leishmania donovani*  
A. *Leishmania* form,  
B. *Leptomonad* form

## Sandfly Stages

## Human Stages



- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**


# Diseases caused

- ▶ **Kala Azar a/k/a Visceral Leishmaniasis**
- ▶ **Fever with enlargement of spleen, lymphnodes**






▶ **Misdiagnosed as malaria**

- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**



# Pathogenesis

- ▶ **Affects immune system**
- ▶ **Complications due to opportunistic infections**

- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**

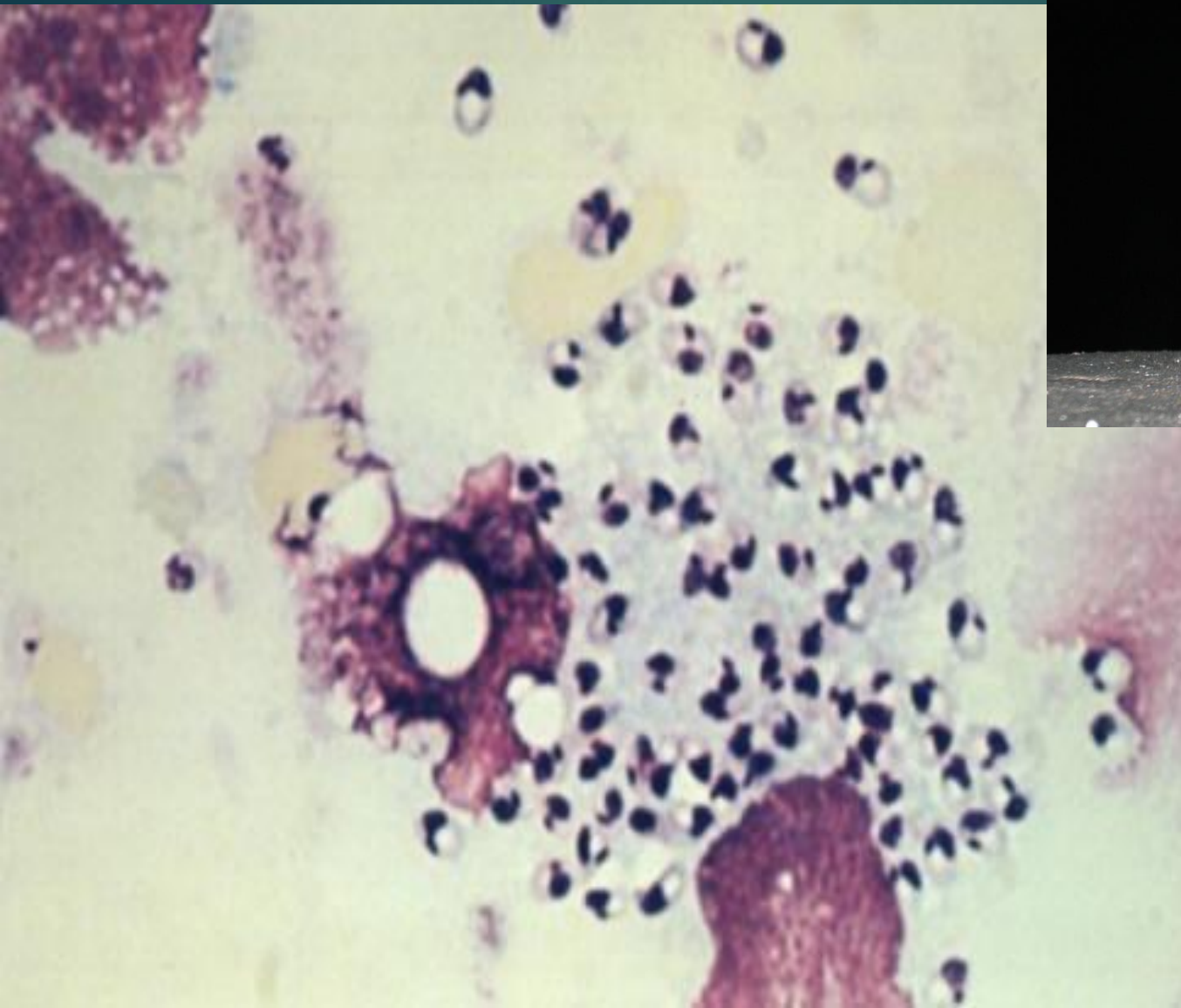
# Lab diagnosis


## ▶ **Direct**

- ❑ **Demonstration of LD body in bone marrow smears**
- ❑ **Culture in NNN medium**

## ▶ **Indirect**

- ❑ **Indirect Haemagglutination test**
- ❑ **ELISA**



- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**

# Treatment

## ▶ **Amphotericin B**




# SPOROZOA

## Plasmodium

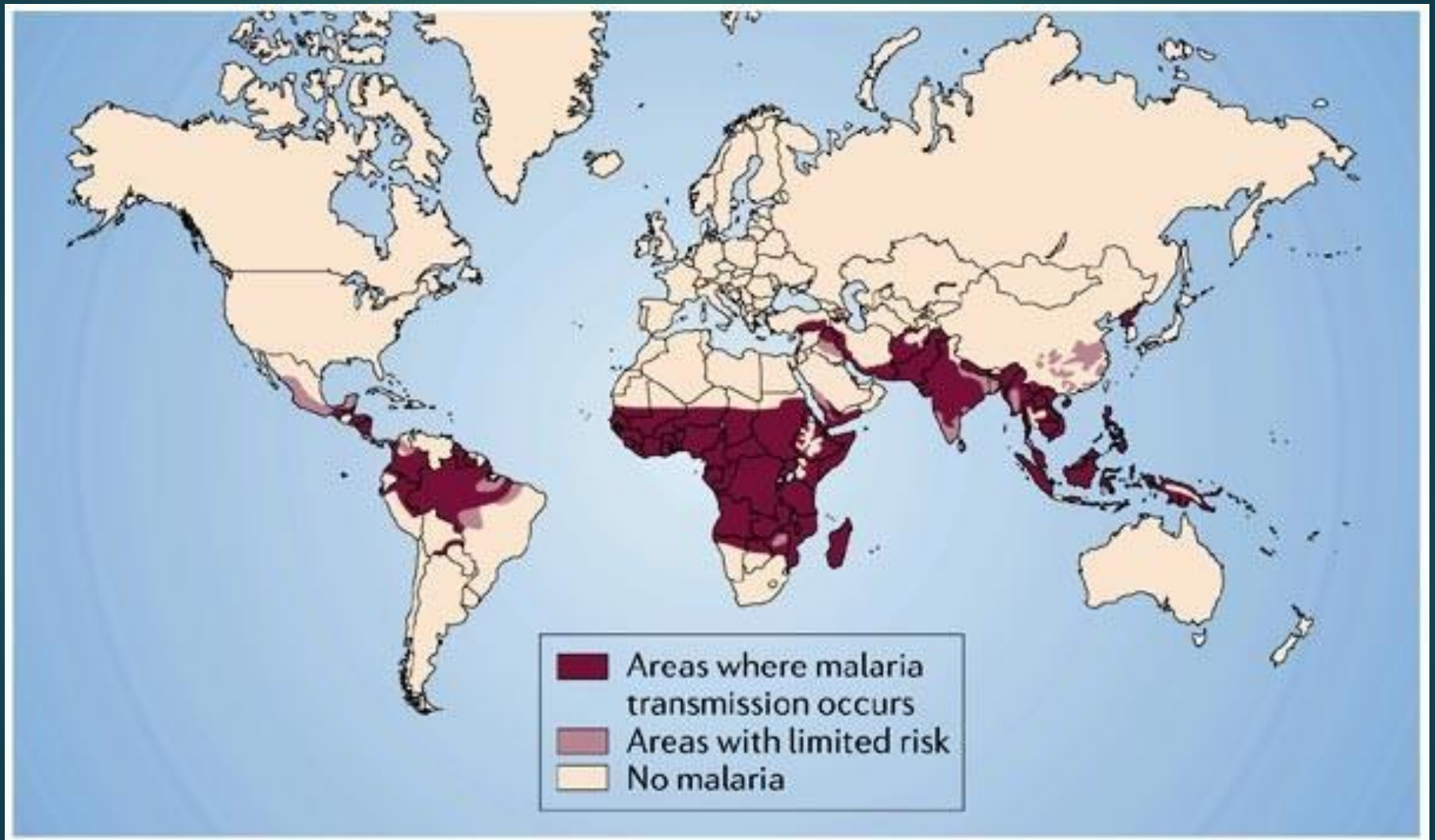
# Malaria


- ▶ **Sporozoite – no special organs of locomotion**
- ▶ **Mal-air = Bad air**
- ▶ **Plasmodium discovered by Sir Ronald Ross in Secunderabad, AP**
- ▶ **Four species**
  - ❑ **P. vivax**
  - ❑ **P. falciparum**
  - ❑ **P. ovale**
  - ❑ **P. malariae**



- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**

# Distribution



- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**

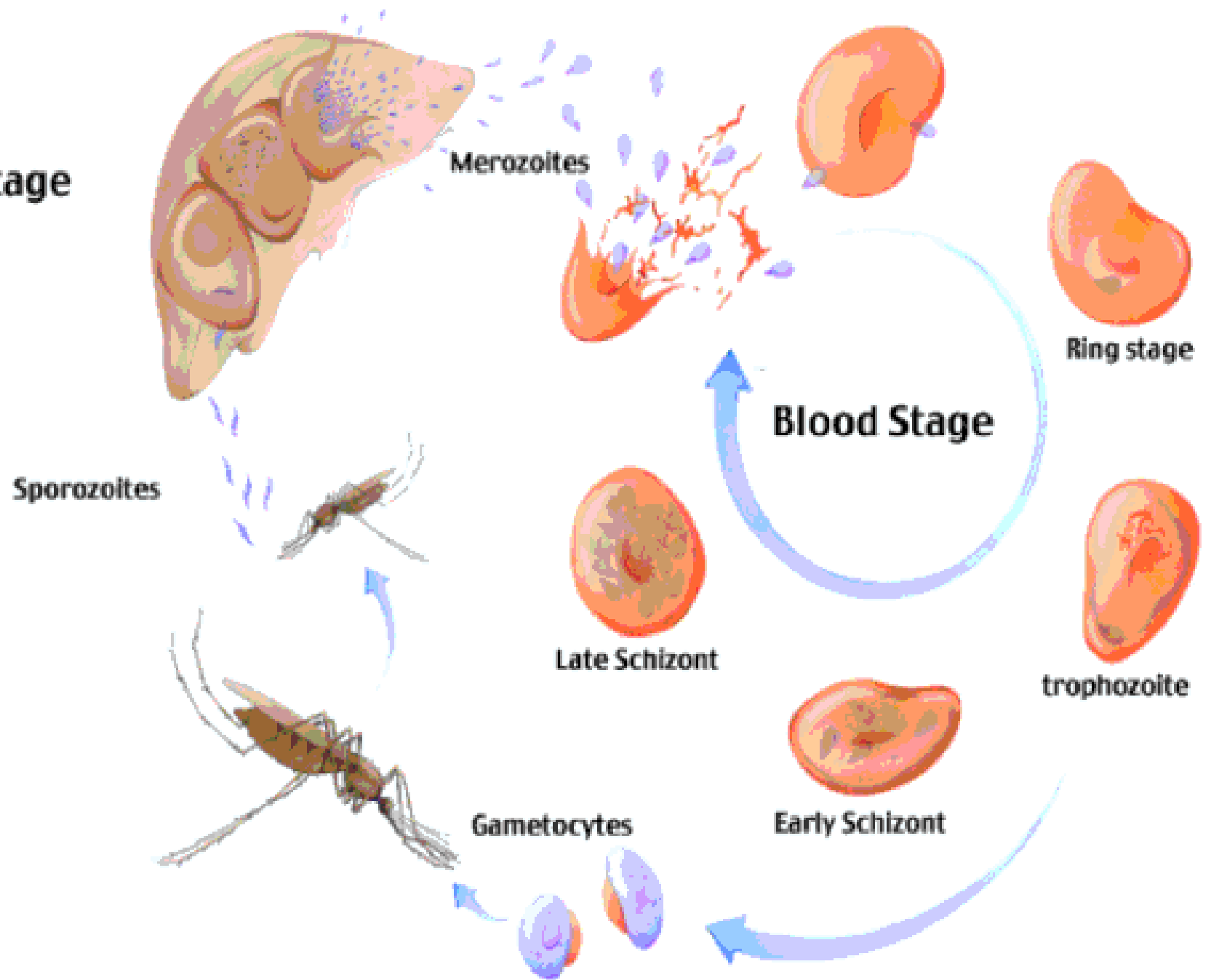
# Location

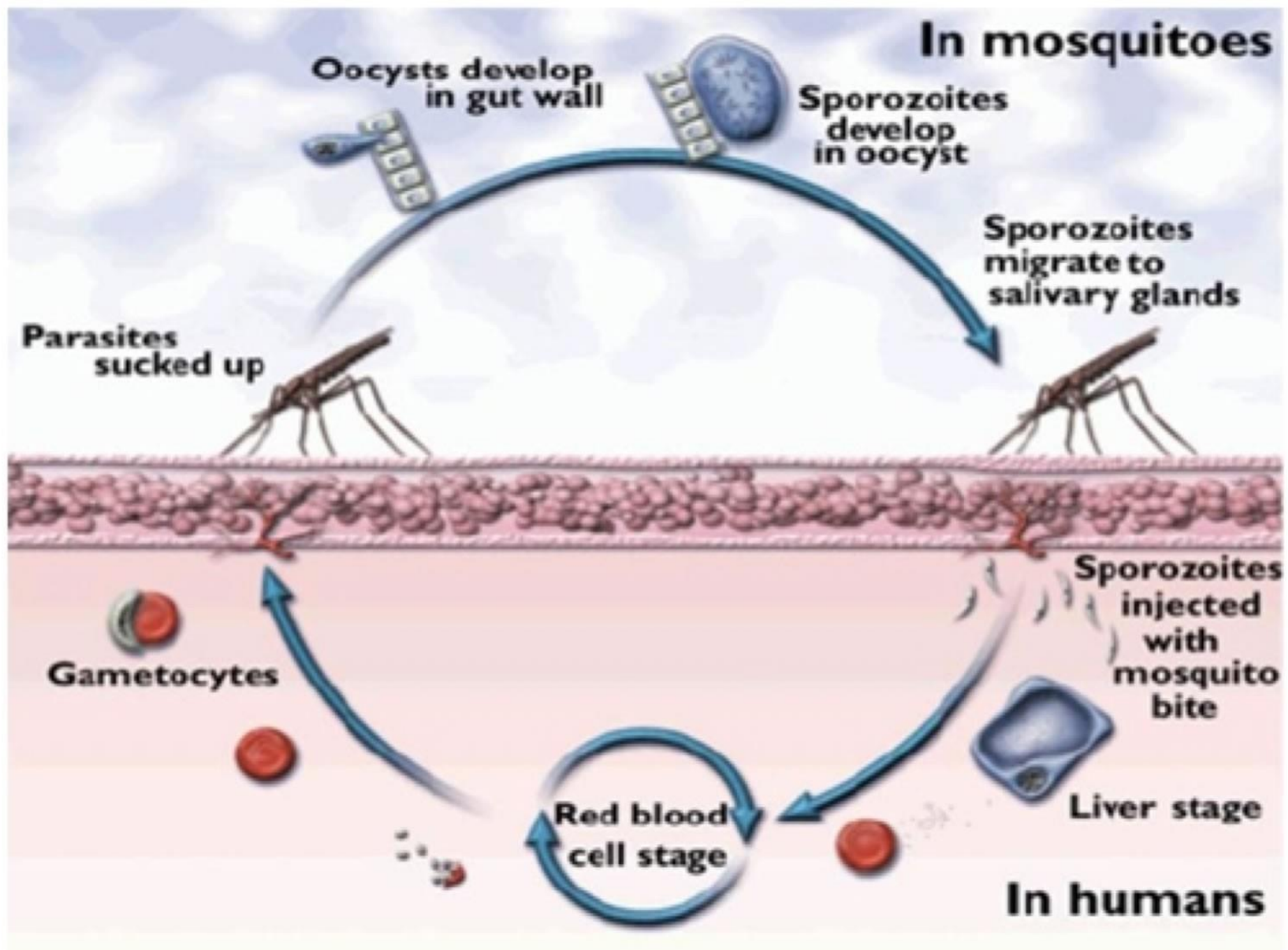
- ▶ **Liver cells**
- ▶ **Red Blood cells**

# Life cycle

- ▶ **Definitive host – Female anopheles mosquito**
- ▶ **Intermediate host – Humans**

# Liver stage

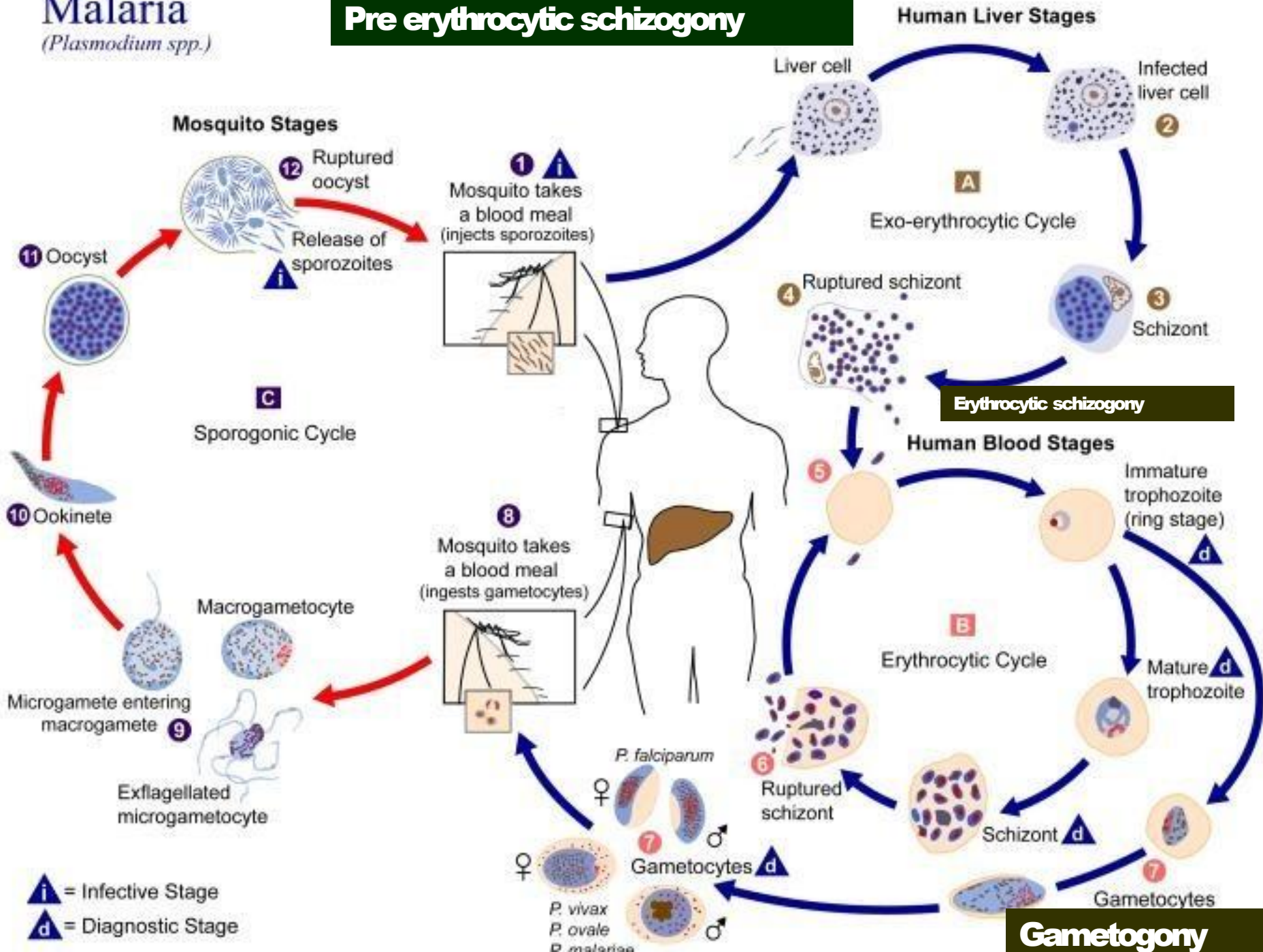




# Malaria

(*Plasmodium spp.*)

## Pre erythrocytic schizogony

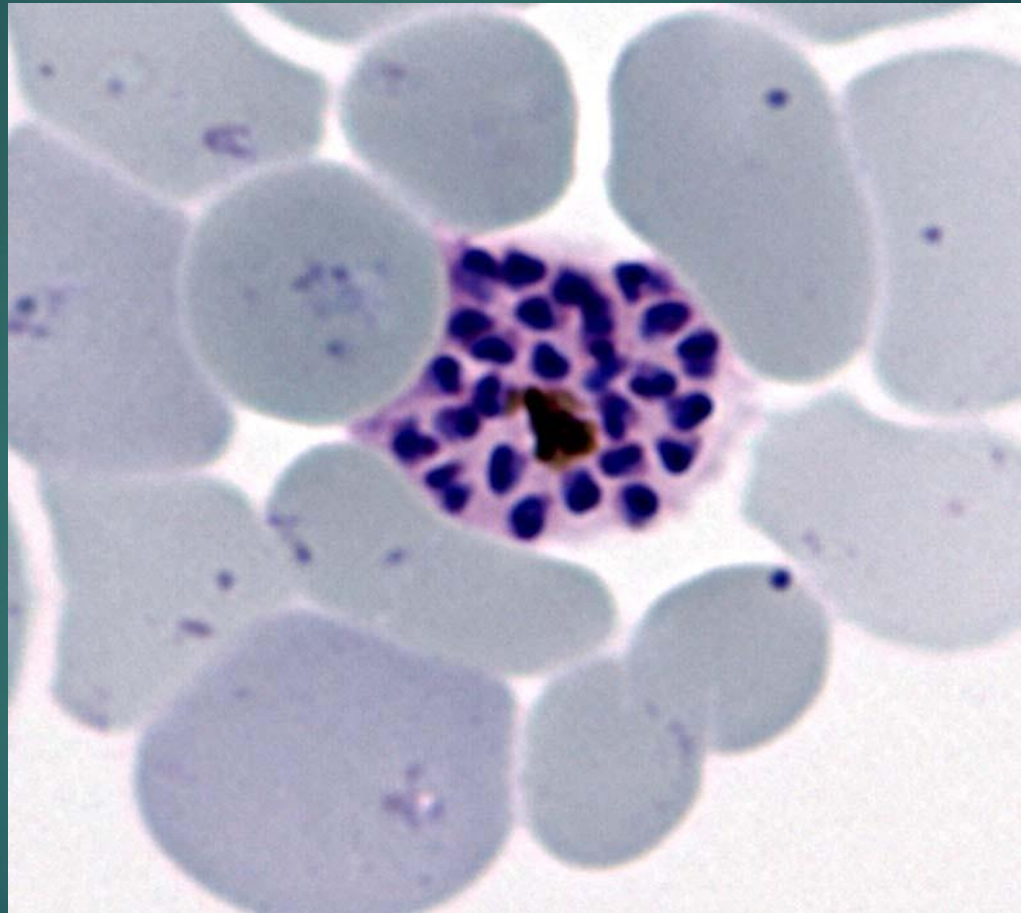




# Morphological forms

- ▶ **Pre erythrocytic schizogony – sporozoites**
- ▶ **Erythrocytic schizogony – trophozoite, schizont and merozoite**
- ▶ **Gametogony – gametes (micro and macro)**
- ▶ **Mosquito – ookinete, oocyst, sporozoite**

# Morphologic forms

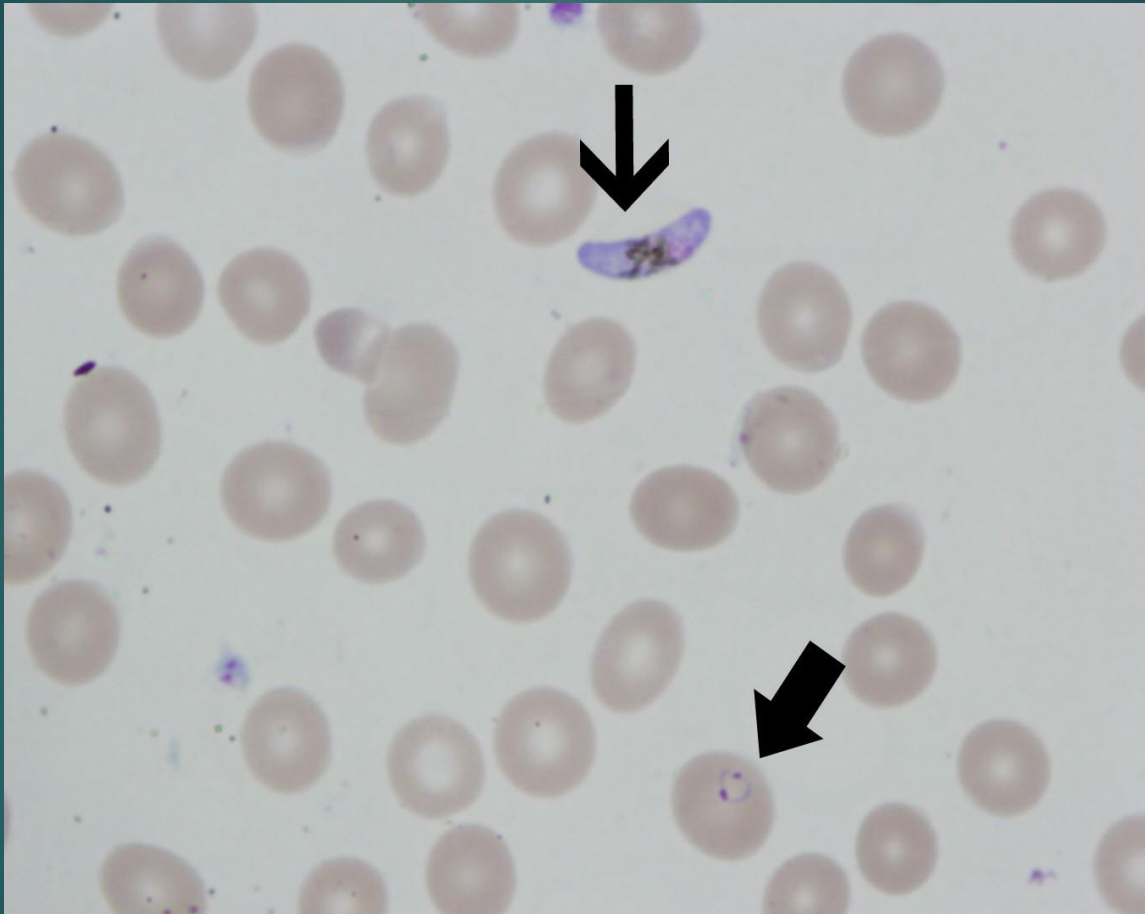







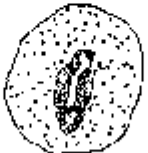


















► schizonts

# Ring forms (trophozoites)



# gametocyte




	vivax	ovale	malariae	falciparum
<b>Ring Stage</b>				
<b>Trophozoite</b>				
<b>Schizont</b>				
<b>Segmenter</b>				
<b>Gametocytes</b>				
				

sequestered

- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**

# Disease caused


- ▶ **Malaria**
- ▶ **Fever with chills – coincides with release of parasites in blood**
- ▶ **Splenomegaly**
- ▶ **Hemolytic anemia**
- ▶ **Black water fever – intravascular hemolysis**
- ▶ **Pernicious malaria – in *P. falciparum***
  - ❑ **Cerebral malaria – brain capillaries clogged with parasites**
  - ❑ **Algid malaria – liver failure**
  - ❑ **septicemia**

- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**



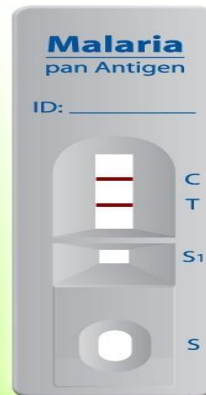
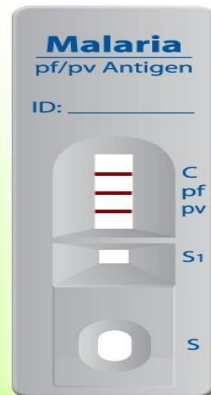
# Pathogenesis


- ▶ **Due to release of parasites in blood – cytokines are released which cause fever and chills**
- ▶ **Hemolytic anemia**

- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**

# Lab diagnosis

- ▶ **Examine blood smears for ring forms/schizonts**
- ▶ **Antigen detection tests**



- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**

# Treatment

- ▶ **Chloroquine**
- ▶ **Artimesin**
- ▶ **Mefloquine**
- ▶ **Primaquine**

# HELMINTHS

# Helminths

- ▶ **Commonly called – ‘worms’**
- ▶ **Three groups**
  - ❑ **Nematodes – unsegmented body**
  - ❑ **Cestodes – segmented body – tape like**
  - ❑ **Trematodes – leaf like - flukes**

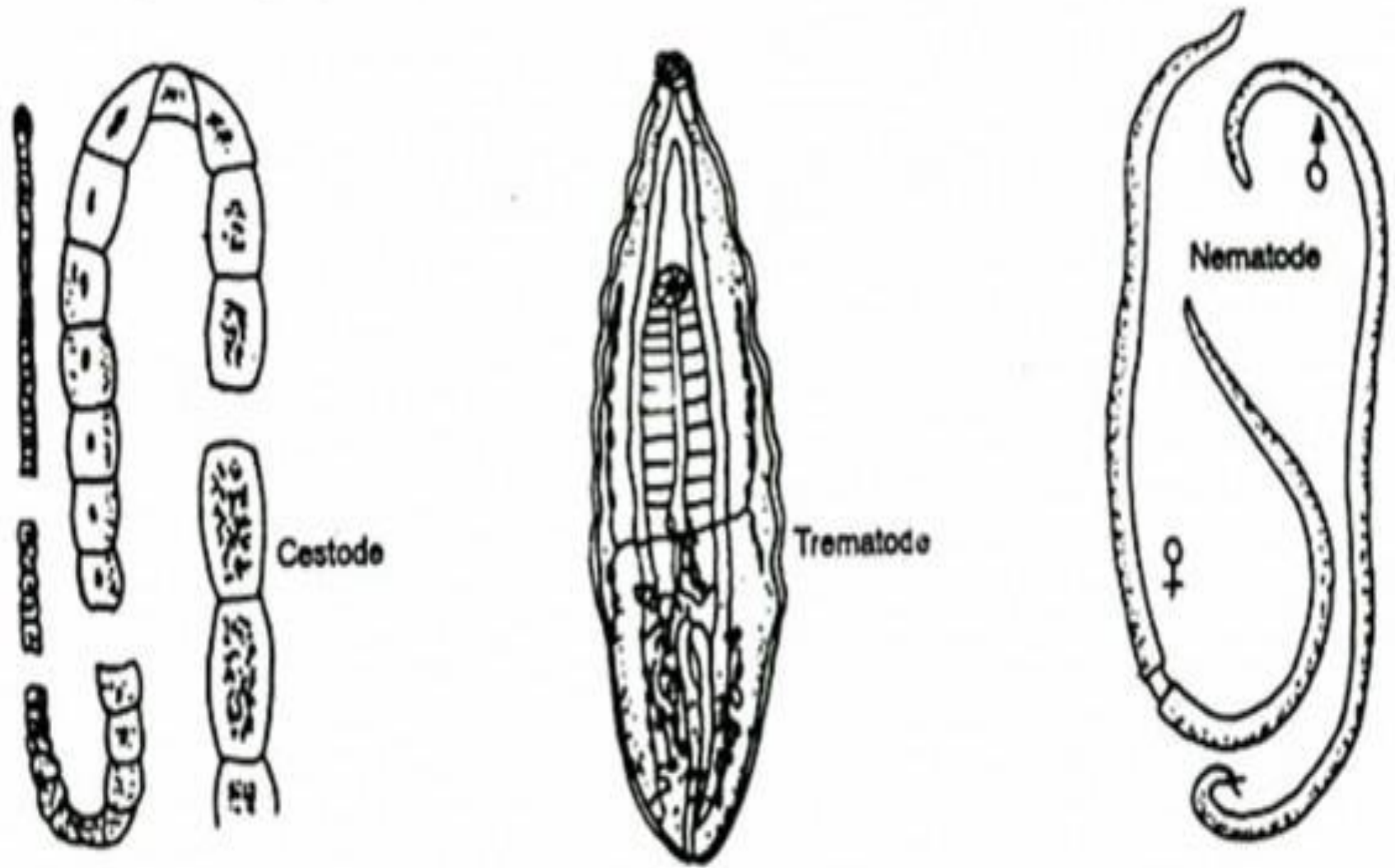


Fig. 23.1: Adult worms of cestode, trematode and nematode



## ▶ **Nematodes**

- ☐ **Round worm**
- ☐ **Hook worm**
- ☐ **Thread worm/pin worm**
- ☐ **Filarial worms**

## ▶ **Cestodes**

- ☐ **T. saginata – Beef tape worm**
- ☐ **T. solium – pork tape worm**
- ☐ **E. granulosus – Dog tape worm**

## ▶ **Trematodes**


- ☐ **Intestinal flukes -**
- ☐ **Liver flukes – C. sinensis, f. hepatica**
- ☐ **Lung flukes – P. westermanii**
- ☐ **Blood flukes – S. hematobium**

# Round worm (*Ascaris Lumbricoides*)

- ▶ **Distribution**
- ▶ **Location**
- ▶ **Life cycle**
- ▶ **Diseases caused**
- ▶ **Pathogenesis**
- ▶ **Lab diagnosis**
- ▶ **Treatment**

# Distribution

▶ **World wide**

- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**

# Location

- ▶ **Small intestine (jejunum)**

- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**

# Life cycle

- ▶ **Humans are the only hosts**

# Morphologic forms

## ► Adult worms

- ❑ Resemble earth worms
- ❑ Male – female separate
- ❑ 2.5 to 4 cm in length, 5
- ❑ Female worm lays 2.5





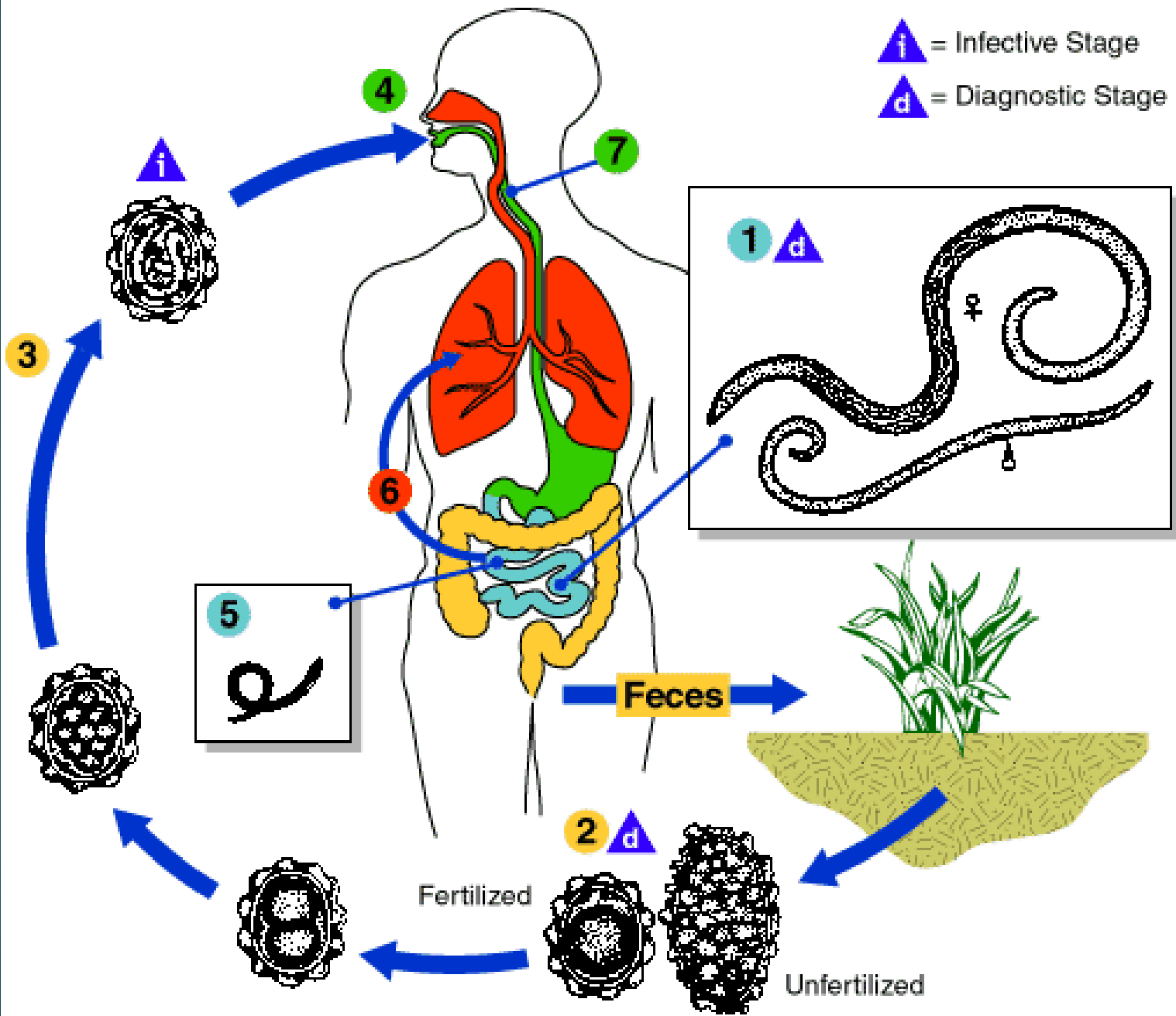
# Morphological forms


## ► Eggs

- ❑ **Bile stained**
- ❑ **Fertilised/unfertilised**
- ❑ **Single unsegmented ovum with clear crescentic areas**



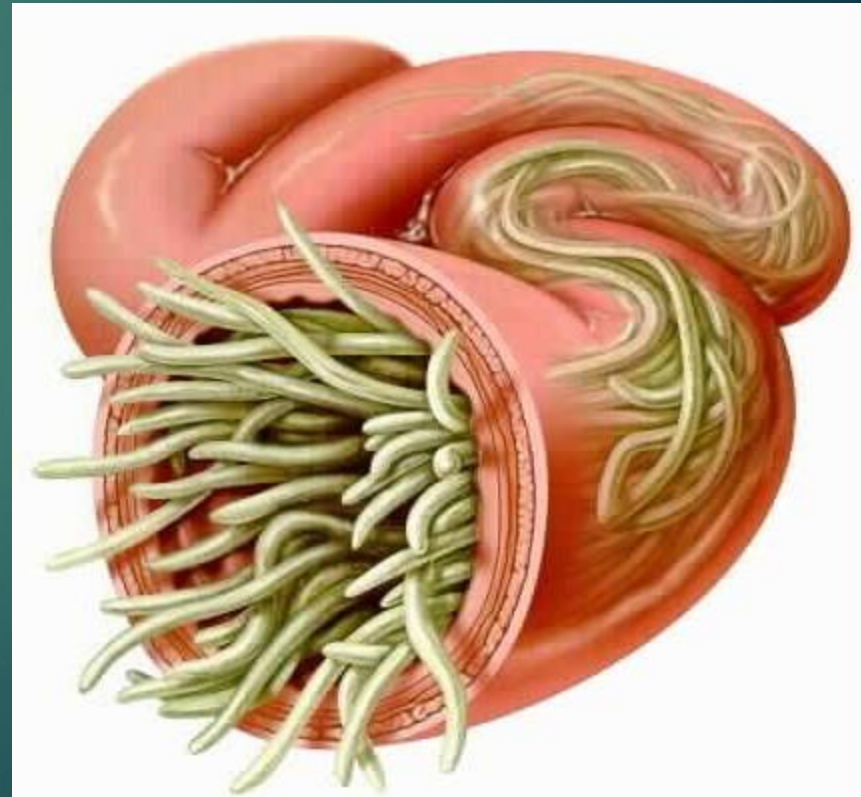
**i** = Infective Stage  
**d** = Diagnostic Stage




- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**

# Diseases caused


- ▶ **Malabsorption of nutrients**
- ▶ **Cough**
- ▶ **Intestinal obstruction**



- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**

# Lab diagnosis

- ▶ **Stool examination**  
**eggs**

- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**

# Treatment


- ▶ **Albendazole**
- ▶ **Mebendazole**



# Hookworm


(*Ancylostoma Duodenale* /  
*Necator Americanus*)



- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**

# Distribution

- ▶ **World wide**
- ▶ **Tropical and subtropical countries**

- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**

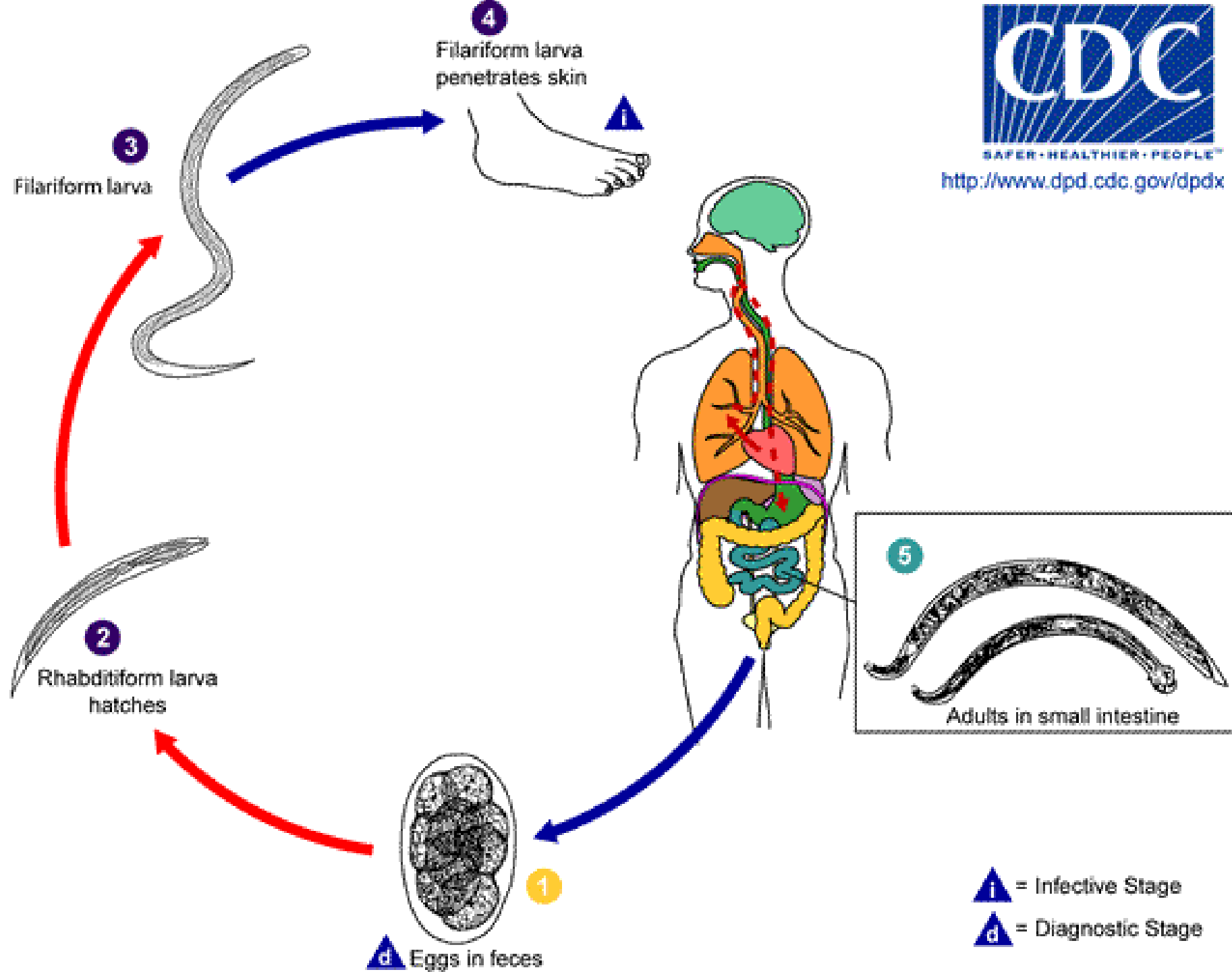
# Location

- ▶ **Small intestine, mainly jejunum**

- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**

# Life cycle

- ▶ **Only one host- humans**



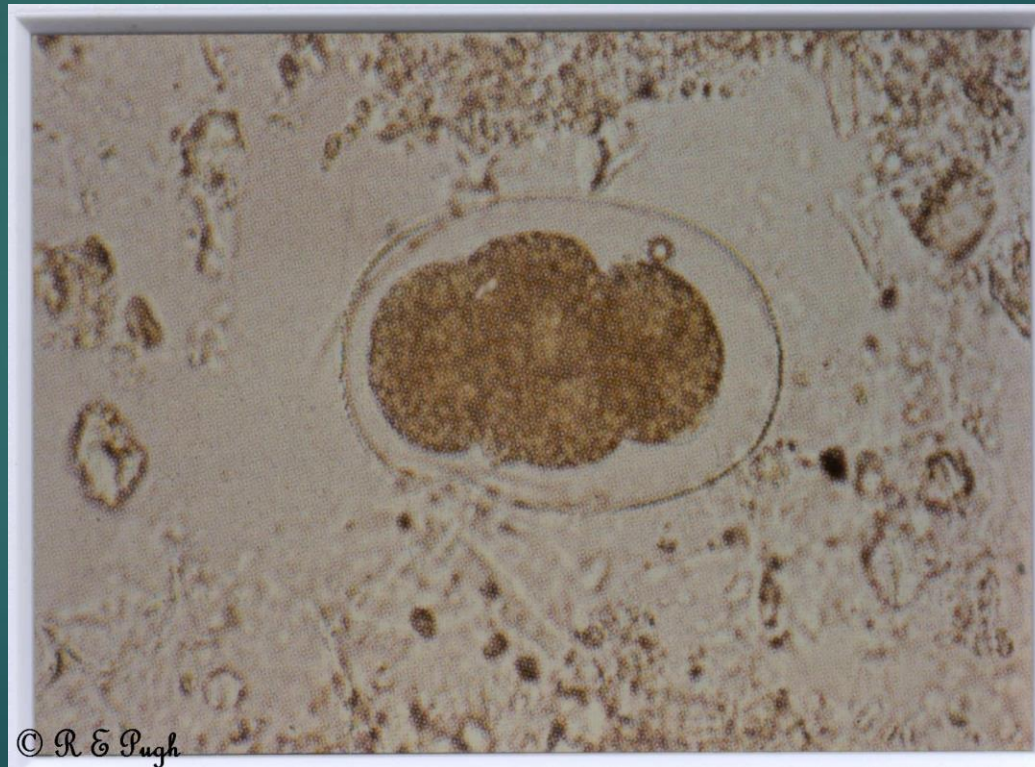
**i** = Infective Stage  
**d** = Diagnostic Stage



# Morphologic forms

## ► Eggs

**Not bile stained**



*Ancylostoma duodenale*

Female




Male



2mm

Peter Darben



- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**

# Diseases caused

- ▶ **Iron deficiency anemia due to chronic blood loss**




- ▶ **Itch at the site of entry into the skin**
- ▶ **Cutaneous larva migrans**



- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**

# Lab diagnosis

- ▶ **Stool – look for eggs**
- ▶ **Indirect –**
  - ❑ **Iron deficiency anemia on PS**
  - ❑ **Stool – occult blood**
  - ❑ **Eosinophilia**

- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**




# Treatment

- ▶ **Albendazole**
- ▶ **Mebendazole**
- ▶ **Pyrantel**


# Thread worm/ Pin worm (Enterobius Vermicularis)



- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**

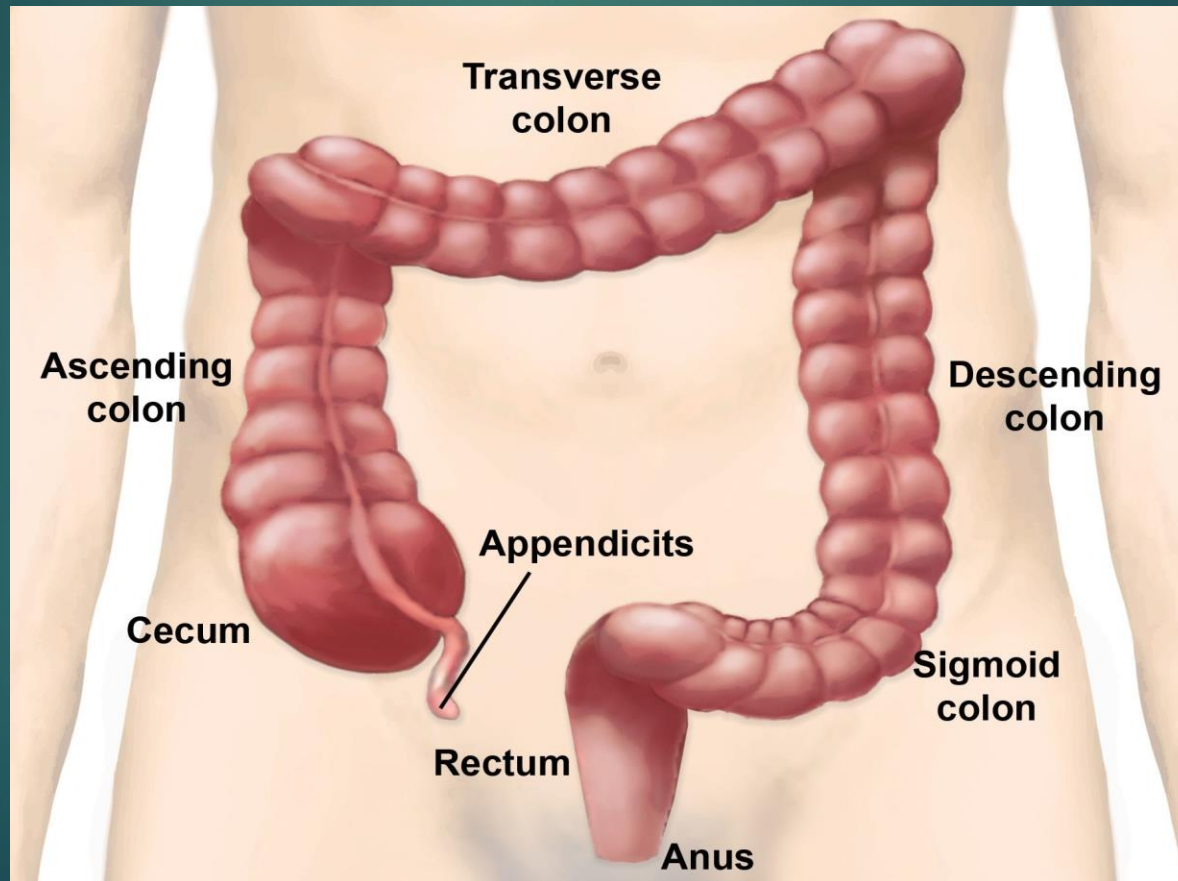
# Distribution


▶ **World wide**

- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**

# Location

## ► Large intestine – cecum and appendix

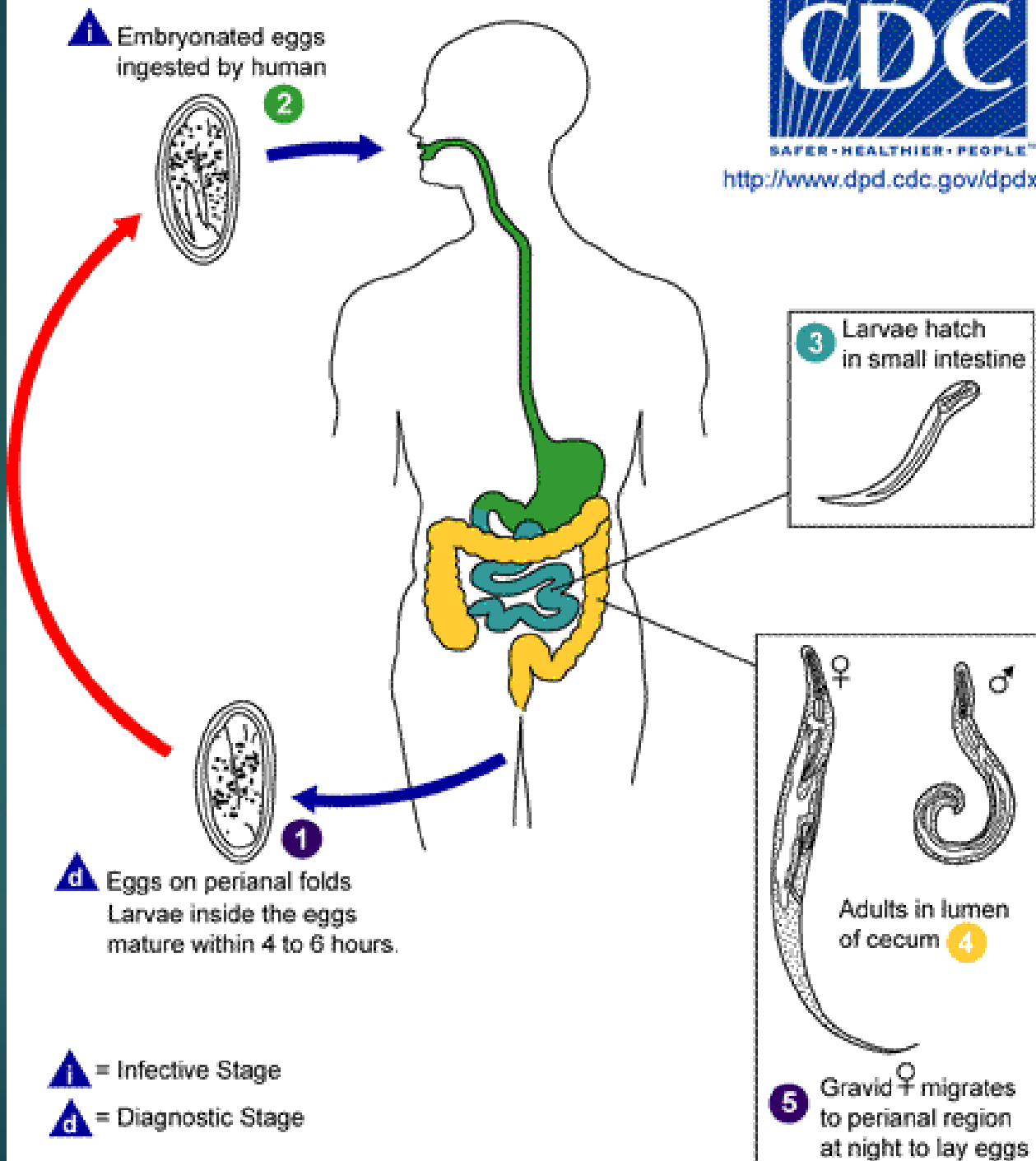


- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**

# Life cycle

- ▶ **Humans are the only host**





**i** = Infective Stage

**d** = Diagnostic Stage

**5** Gravid ♀ migrates to perianal region at night to lay eggs


# Morphologic forms

## ▶ Eggs



## ► Adult worms



- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**

# Diseases caused

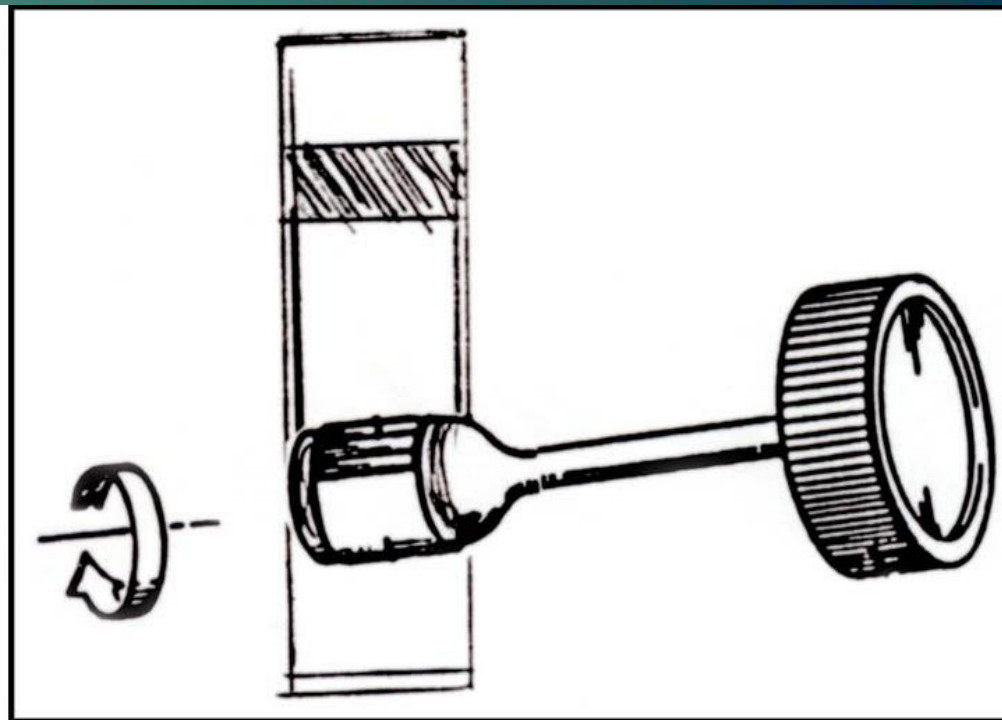
- ▶ **Pruritis ani**
- ▶ **Nocturnal enuresis**




- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**

# Lab diagnosis

- ▶ **NIH swab (National institute of health) for demonstrating eggs**
- ▶ **Demonstration of adult worms in stool**



- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**




# Treatment

- ▶ **Albendazole**
- ▶ **Mebendazole**
- ▶ **Pyrantel**

# FILARIASIS


(*W. bancroftii*, *B. malayii*)



- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**

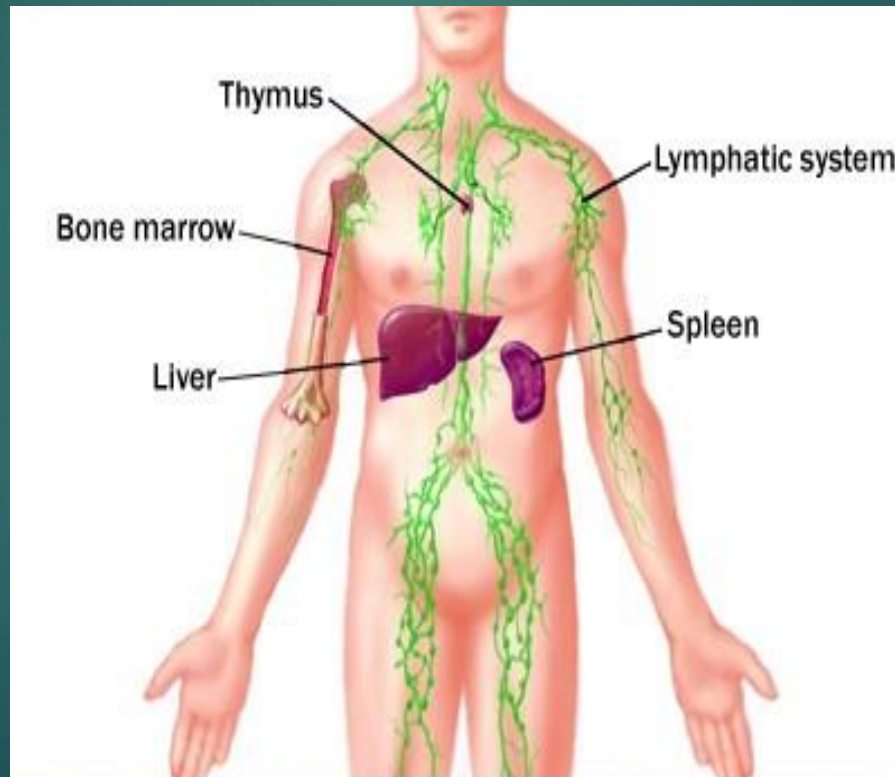
# Distribution


- ▶ **World wide – including India**

- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**

# Location

- ▶ **Adult worm – lymphatics**
- ▶ **Microfilaria - blood**



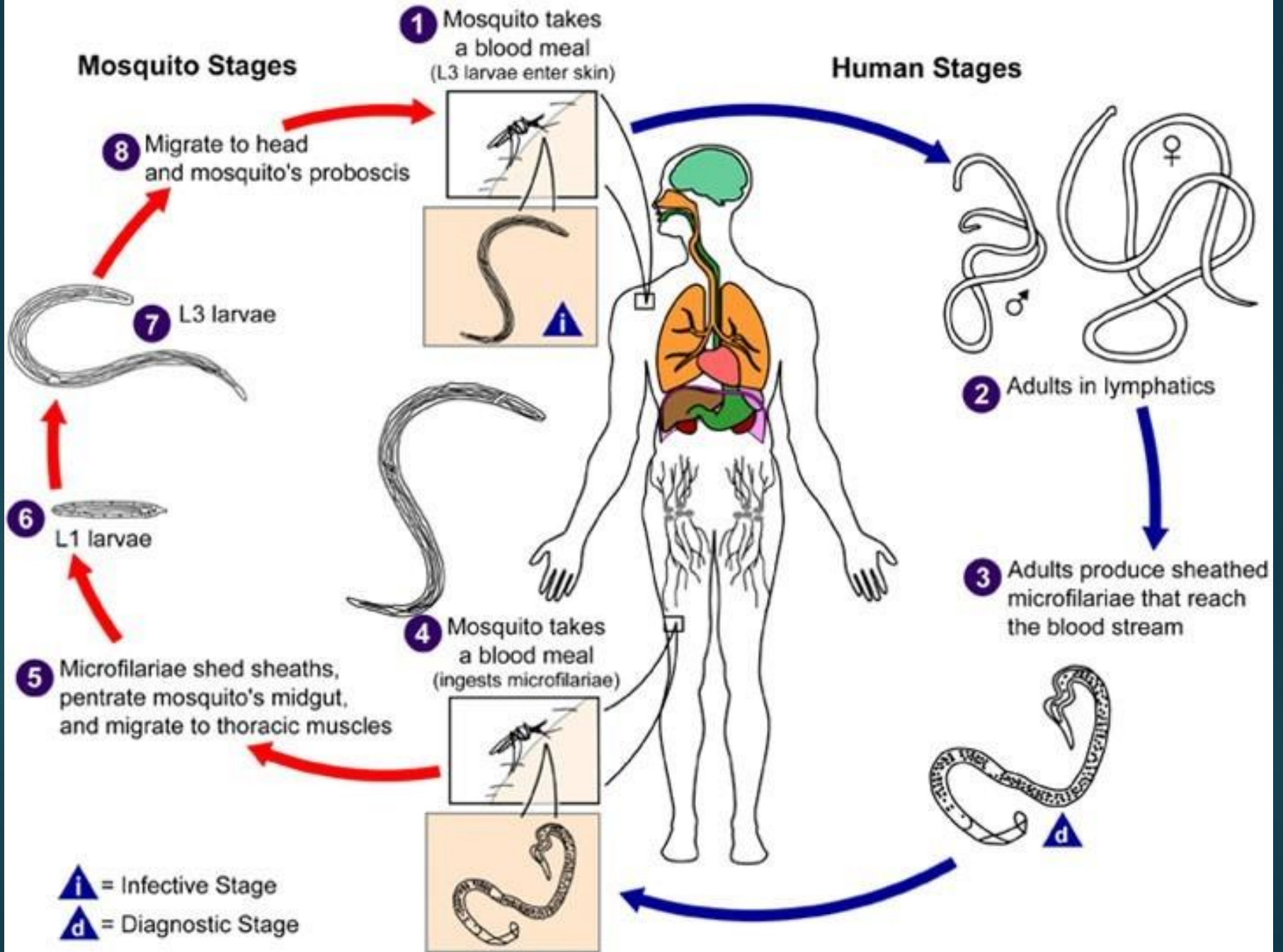
- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**

# Life cycle

- ▶ **Humans – definitive host**
- ▶ **Culex/anopheles/aedes mosquito – intermediate host**





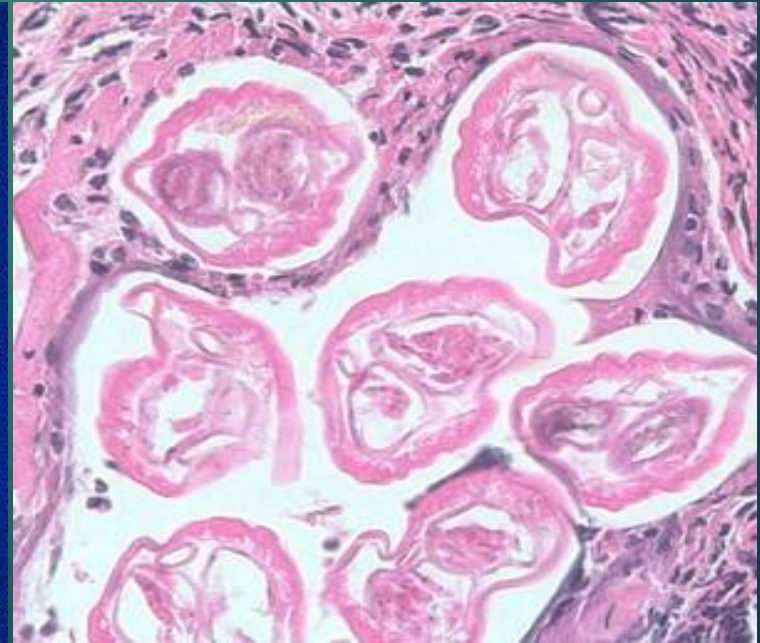
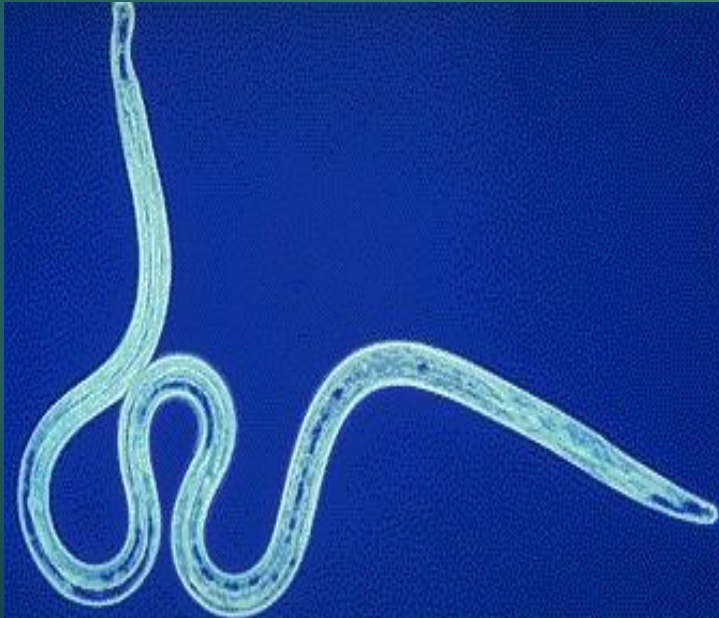


This illustration depicts the life cycle of *Brugia malayi*, one of the parasitic worms that cause the tropical disease lymphatic filariasis. Credit: CDC

# Morphological forms

## ► **Adult worm**

- ❑ **Female – 10 cm**
- ❑ **Male – shorter**
- ❑ **Lay eggs containing embryo (microfilaria)**




## ▶ **Microfilaria**

❑ **290 microns**

❑ **Present in peripheral blood**



- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**

# Elephantiasis

- ▶ **Adult worm causes blockage of lymphatic channels**



- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**

# Lab diagnosis


## ▶ **Microfilaria demonstration**

- ❑ **Parasites seen in blood between 10 pm and 2 am**
- ❑ **Co incides with feeding time of mosquitoes**



▶ **Adult worm demonstration**  
**Lymphnode biopsy**



- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**

# Treatment

- ▶ **DEC (Diethylcarbamazine) helps treat filariasis**
- ▶ **But elephantiasis once developed cannot be cured**



# Cestodes

**Taenia Saginata**  
**Taenia Solium**  
**E. Granulosus**

# Taenia Saginata/Taenia solium

(beef tapeworm/pork tape

▶ **Distribution**  
worm)

▶ **Location**

▶ **Life cycle**

▶ **Diseases caused**

▶ **Pathogenesis**

▶ **Lab diagnosis**

▶ **Treatment**

# Distribution

## ▶ **Saginata**

### ▶ **World wide in beef eating population**

❑ **Not seen in India in regions where beef is not eaten**


## ▶ **Solium**

❑ **World wide in pork eating population**

- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**

# Location

▶ **Small intestine**

- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**



# Life cycle

## ▶ **Saginata**

❑ **Definitive host – humans**

❑ **Intermediate host – cows and buffalos**

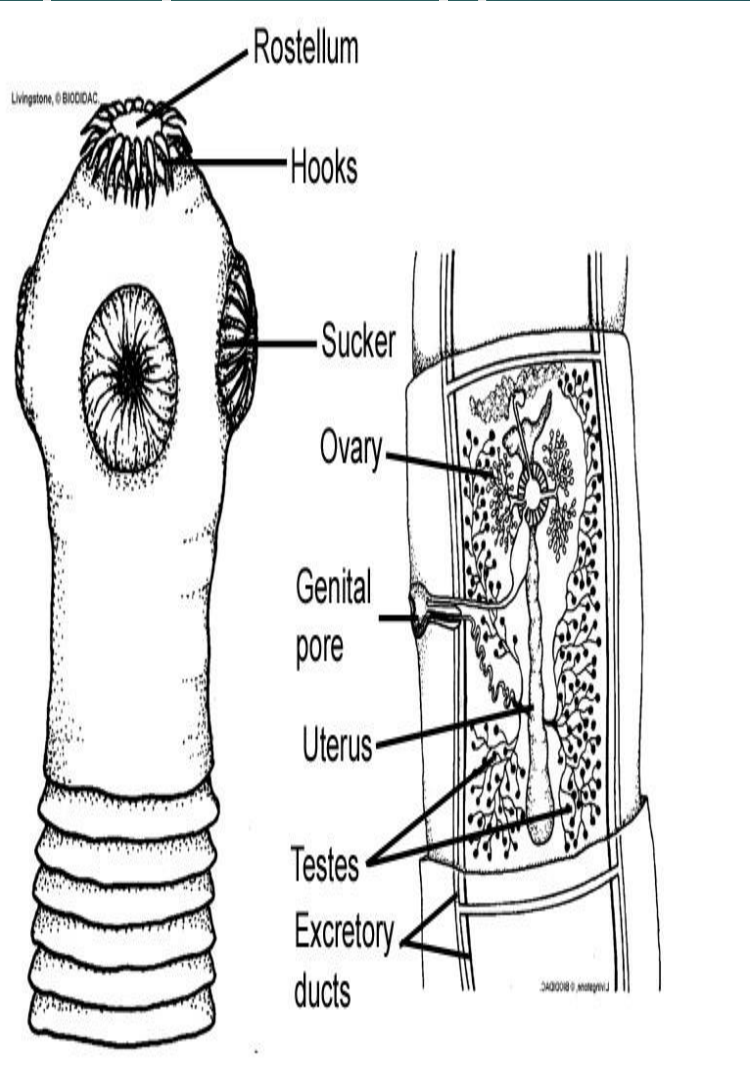
## ▶ **Solium**

❑ **Definitive host – humans**

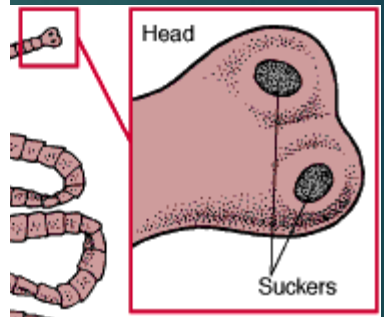
❑ **Intermediate hosts - pigs**

# Morphology of

- ▶ **Adult worm (A)**
- ❓ **Inside human**
- ❓ **Segmented -**
- passed in fe**



contain eggs –



# Morphological forms

## ▶ **Adult worm – solium**

**Similar except for additional rostellum / hooklets**



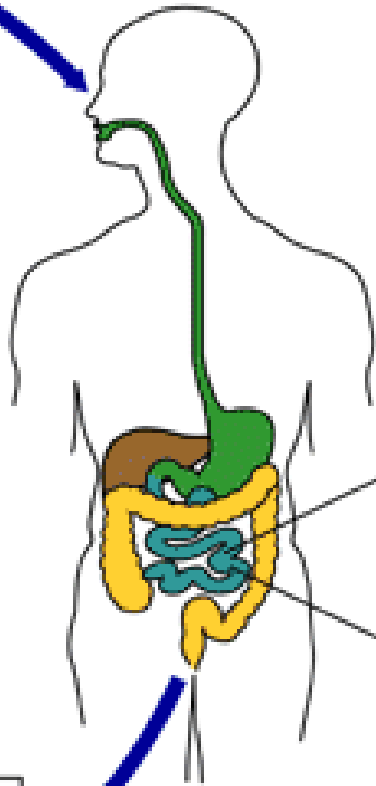
- ▶ **Eggs (same for both)**  
**Spherical and bile stained**



**1** Oncospheres develop into cysticerci in muscle



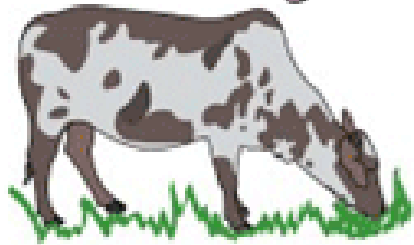
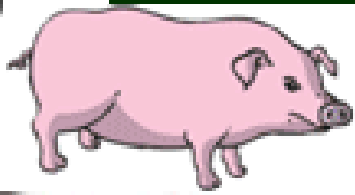
**4** Humans infected by ingesting raw or undercooked infected meat



Oncospheres hatch, penetrate intestinal wall, and circulate to musculature

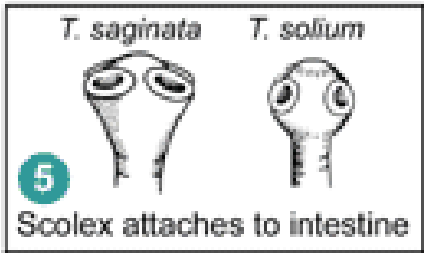
**CYSTICERCUS**

**3**



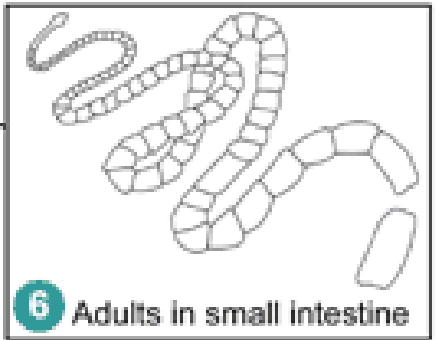
**2**

Cattle (*T. saginata*) and pigs (*T. solium*) become infected by ingesting vegetation contaminated by eggs or gravid proglottids



**5**

Scolex attaches to intestine



**6**

Adults in small intestine

*T. saginata*    *T. solium*

**i** = Infective Stage  
**d** = Diagnostic Stage

**1**

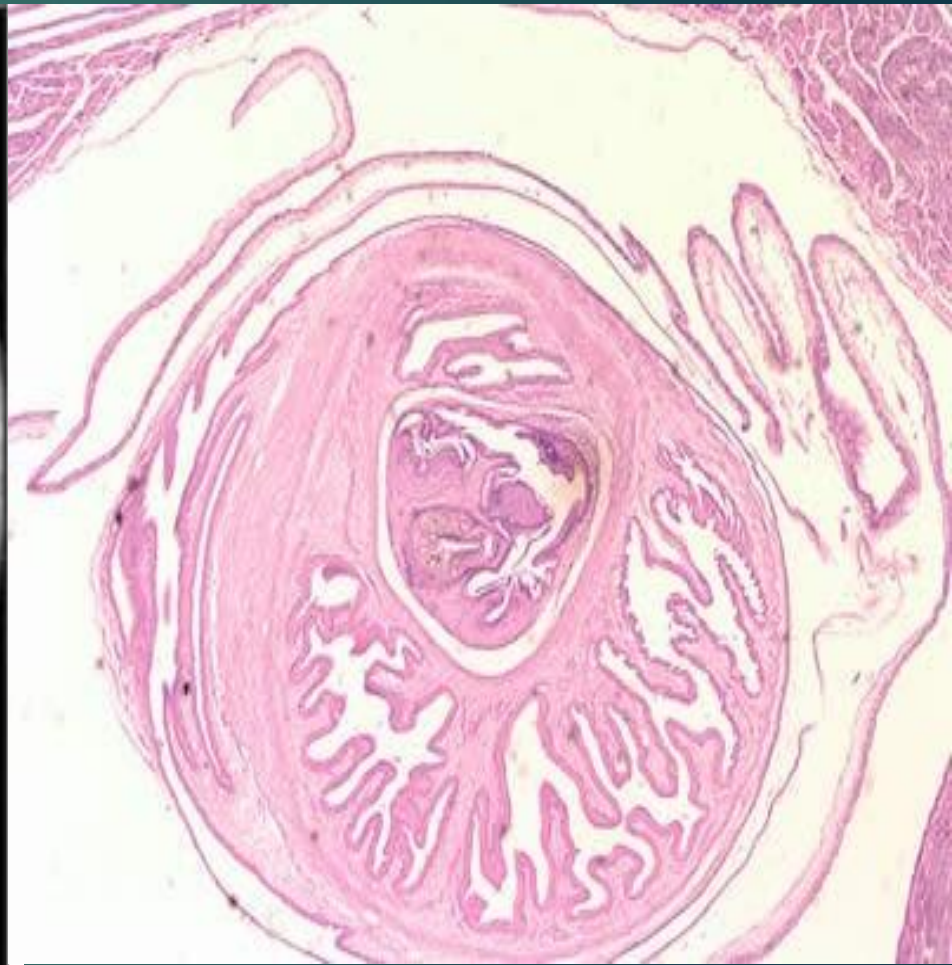
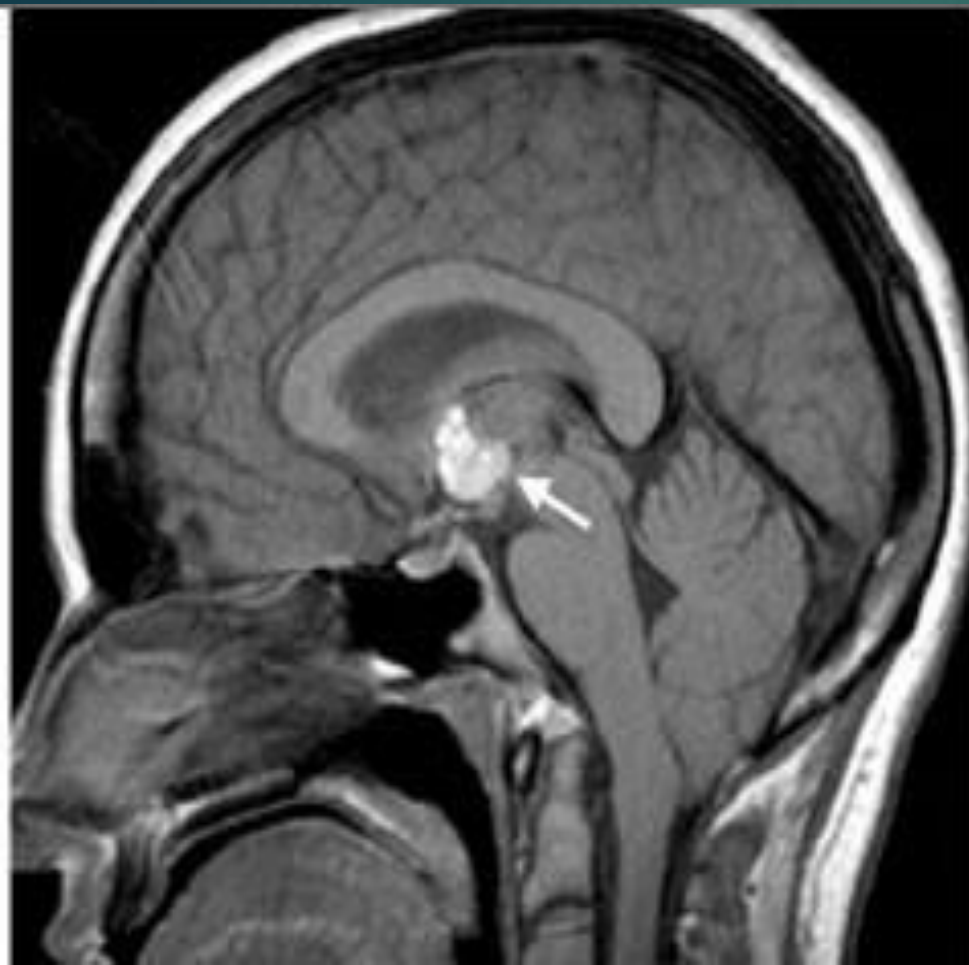
Eggs or gravid proglottids in feces and passed into environment




- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**

# Diseases caused

- ▶ **Disease is asymptomatic and remains undiagnosed**
- ▶ **Problem is that humans may act as occasional intermediate hosts in case of *T. solium***
  - ❑ **Called cysticercosis**
  - ❑ **Patients present with seizures/convulsions**






- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**

# Lab diagnosis

- ▶ **Not really possible!!**
- ▶ **Unless there is cysticercosis**
  - ❑ **CT SCAN**
  - ❑ **Biopsy**

- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**

# Treatment

## ▶ Mepacrine




# Echinococcus Granulosus

(Dog tape worm)

- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**

# Distribution


- ▶ **World wide**
- ▶ **Where sheep and cattle are bred**
- ▶ **There must be a close association between humans, sheep and dogs**

- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**



# Location

- ▶ **Liver**
- ▶ **Lungs**
- ▶ **Wherever embryos settle**

- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**

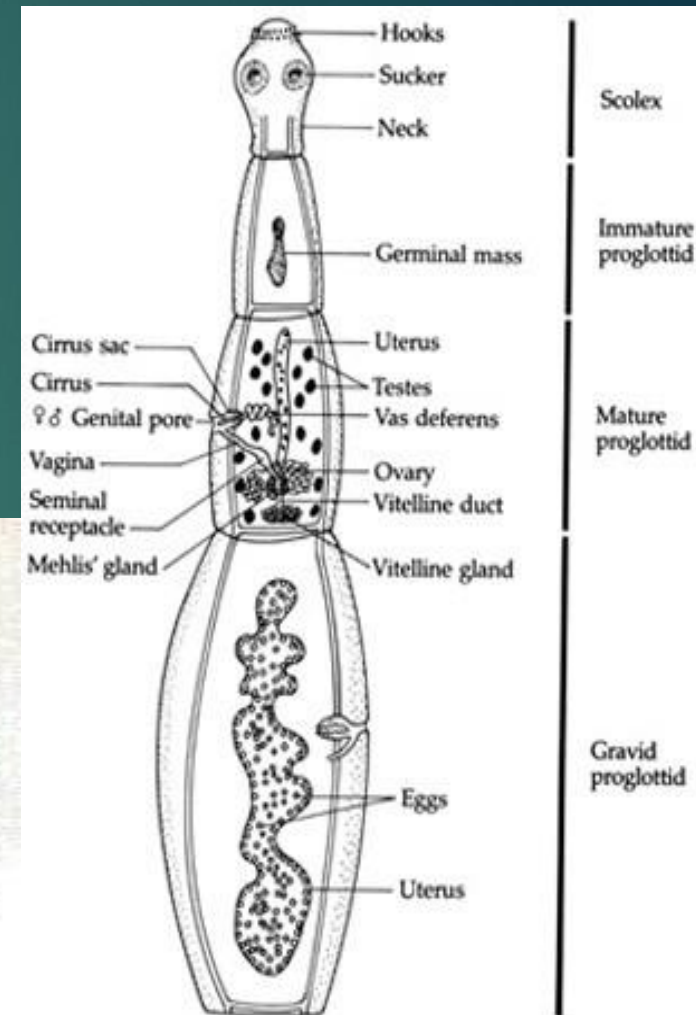
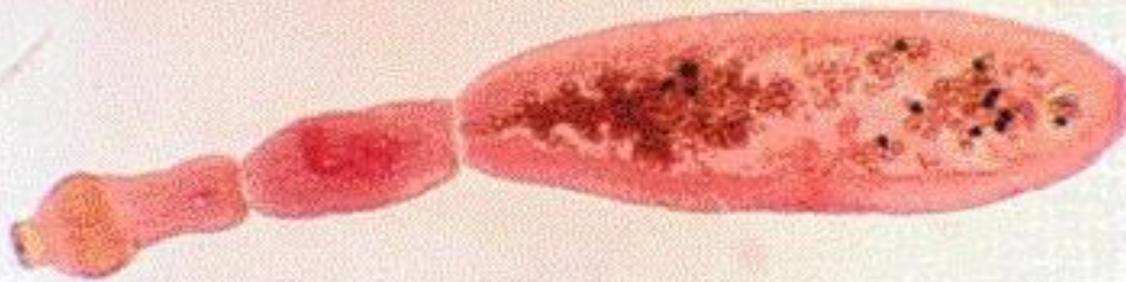
# Life cycle

- ▶ **Dog is definitive host**
- ▶ **Sheep are intermediate hosts**
- ▶ **Humans are accidental intermediate hosts**

# Morphological forms

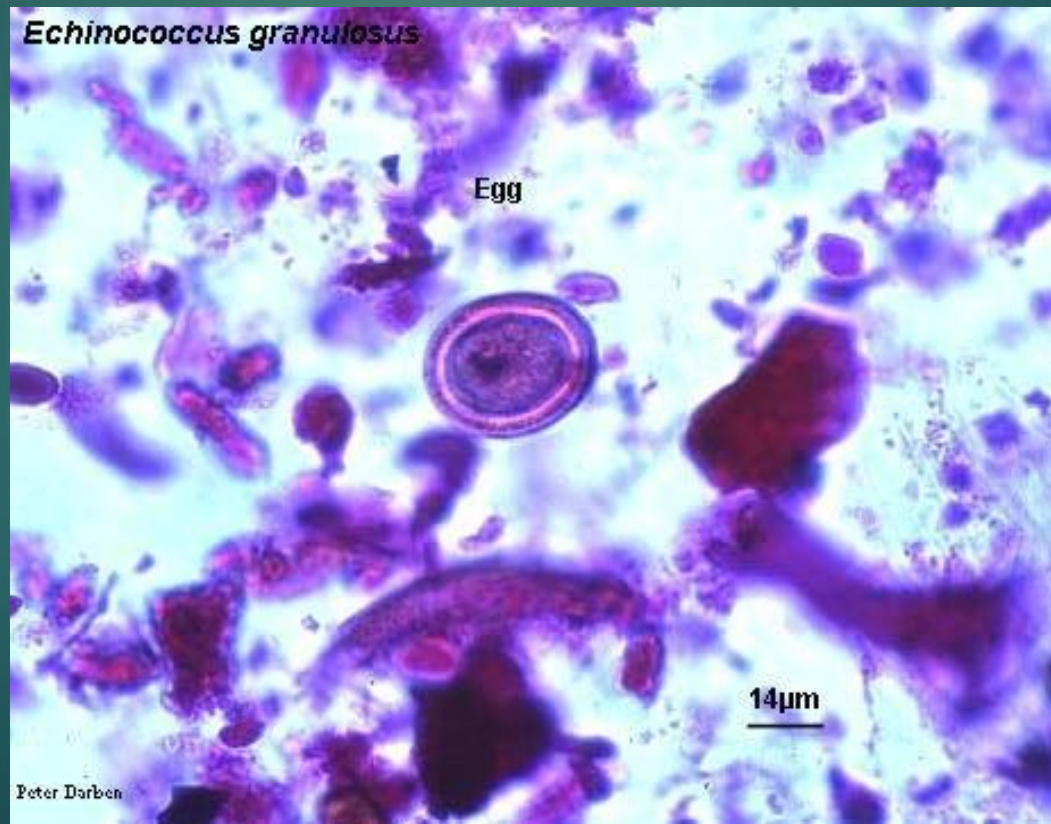
## ► Adult worm

- ❑ Inside definitive hosts
- ❑ Has head, neck and strobila
- ❑ Has 4 segments
- ❑ Head has suckers (rostellum)

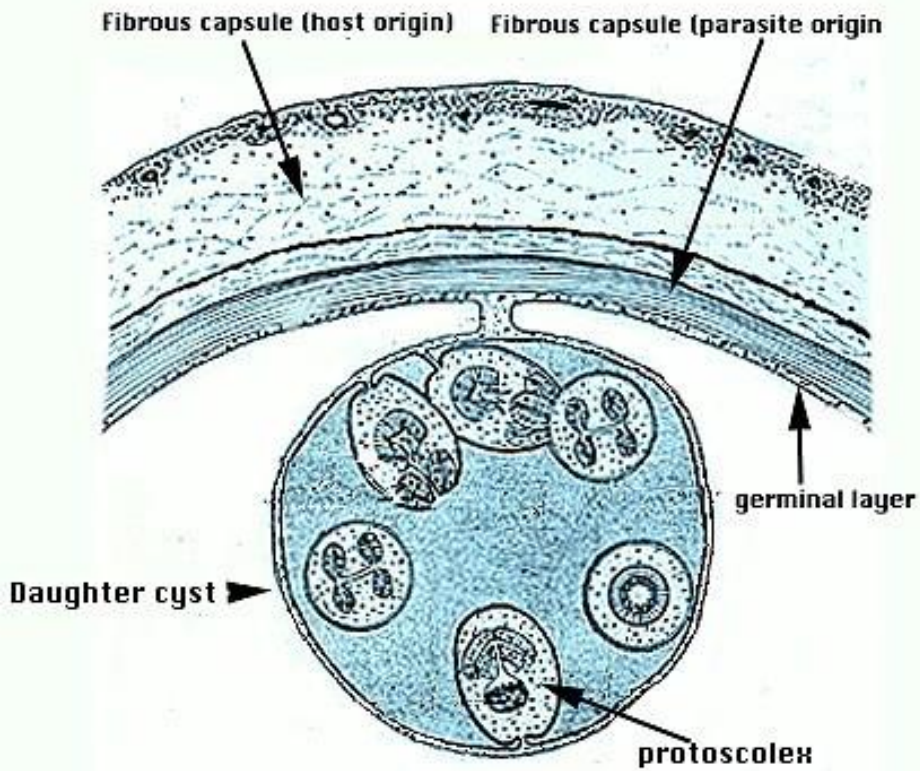


## ► Eggs

Indistinguishable from *T. saginata*/*solium*

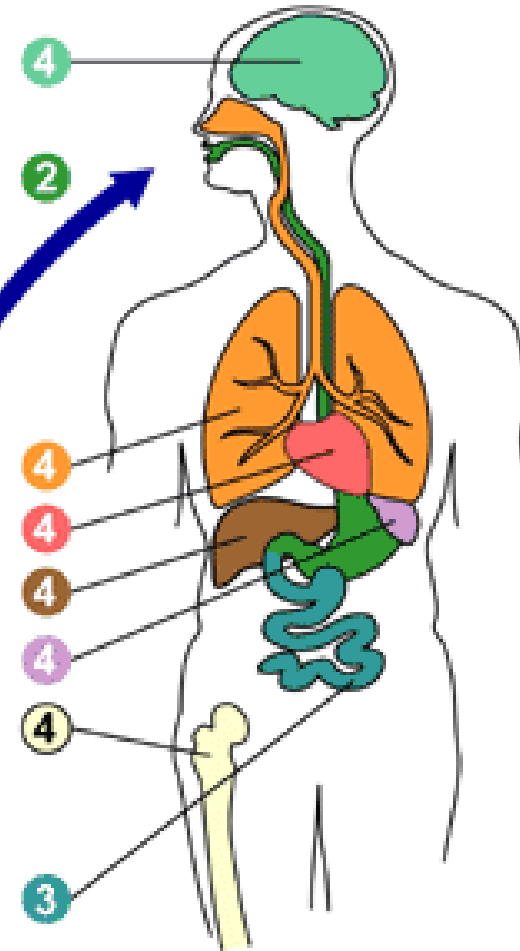
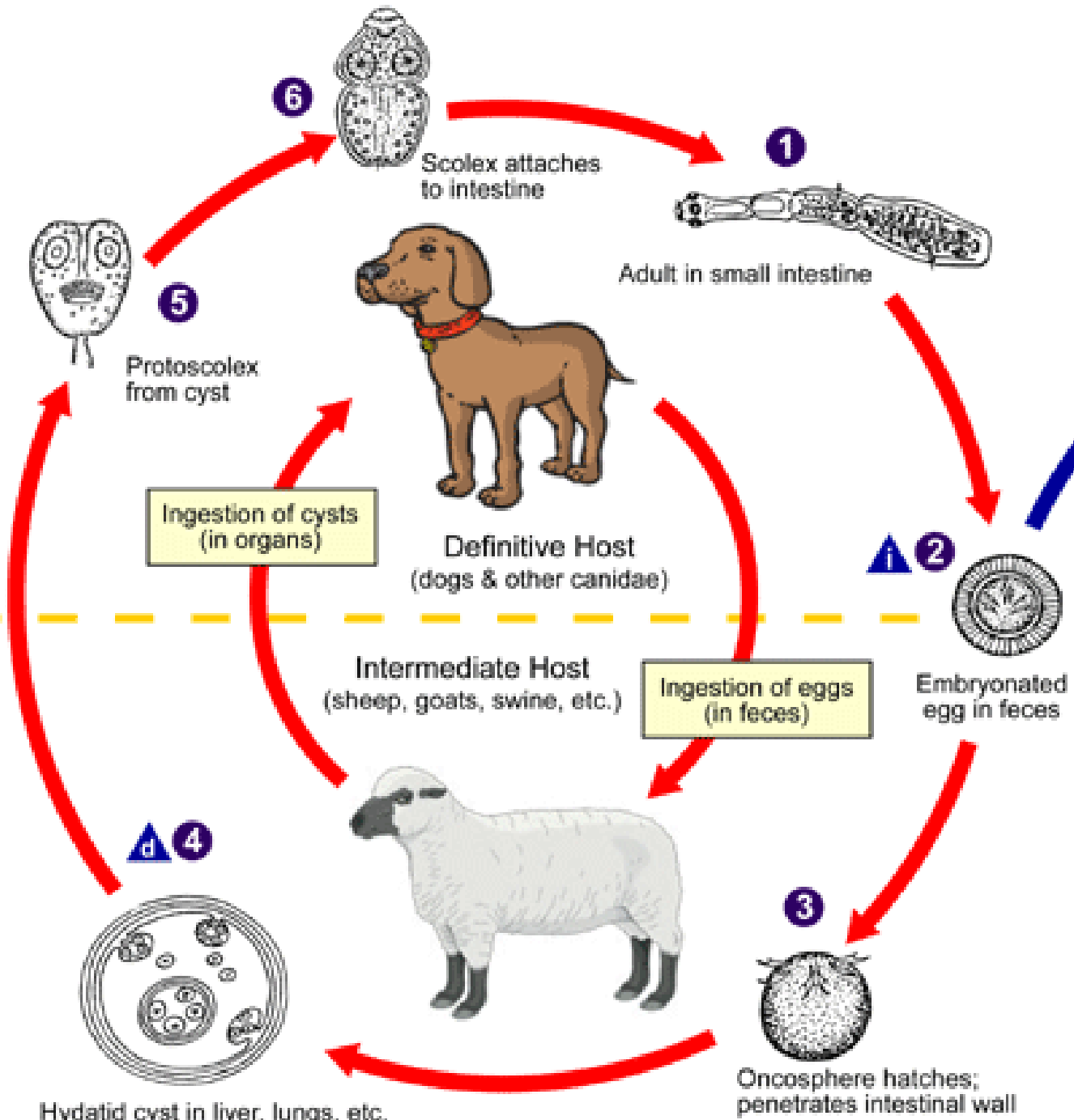


## ► Larva (hydatid cyst)




Hydatid cyst






**i** = Infective Stage  
**d** = Diagnostic Stage

- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**




# Diseases caused

- ▶ **Hydatid cyst can remain undetected for many years**
- ▶ **It causes symptoms depending on the organ in which it has formed**
- ▶ **Rupture of cyst can cause anaphylactic shock**

- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**

# Lab diagnosis

- ▶ **Casoni's test**
- ▶ **Eosinophilia**
- ▶ **Serological tests**
- ▶ **Examination of cyst fluid**
- ▶ **CT scan, USG, X ray**

- 
- ▶ **Distribution**
  - ▶ **Location**
  - ▶ **Life cycle**
  - ▶ **Diseases caused**
  - ▶ **Pathogenesis**
  - ▶ **Lab diagnosis**
  - ▶ **Treatment**

# Treatment

- ▶ **Surgical removal without rupture**

# TREMATODES

- ▶ **Least commonly reported in India**
- ▶ **Refer to examples at the starting of this lecture**
- ▶ **Detailed discussion is beyond the scope of this lecture**