



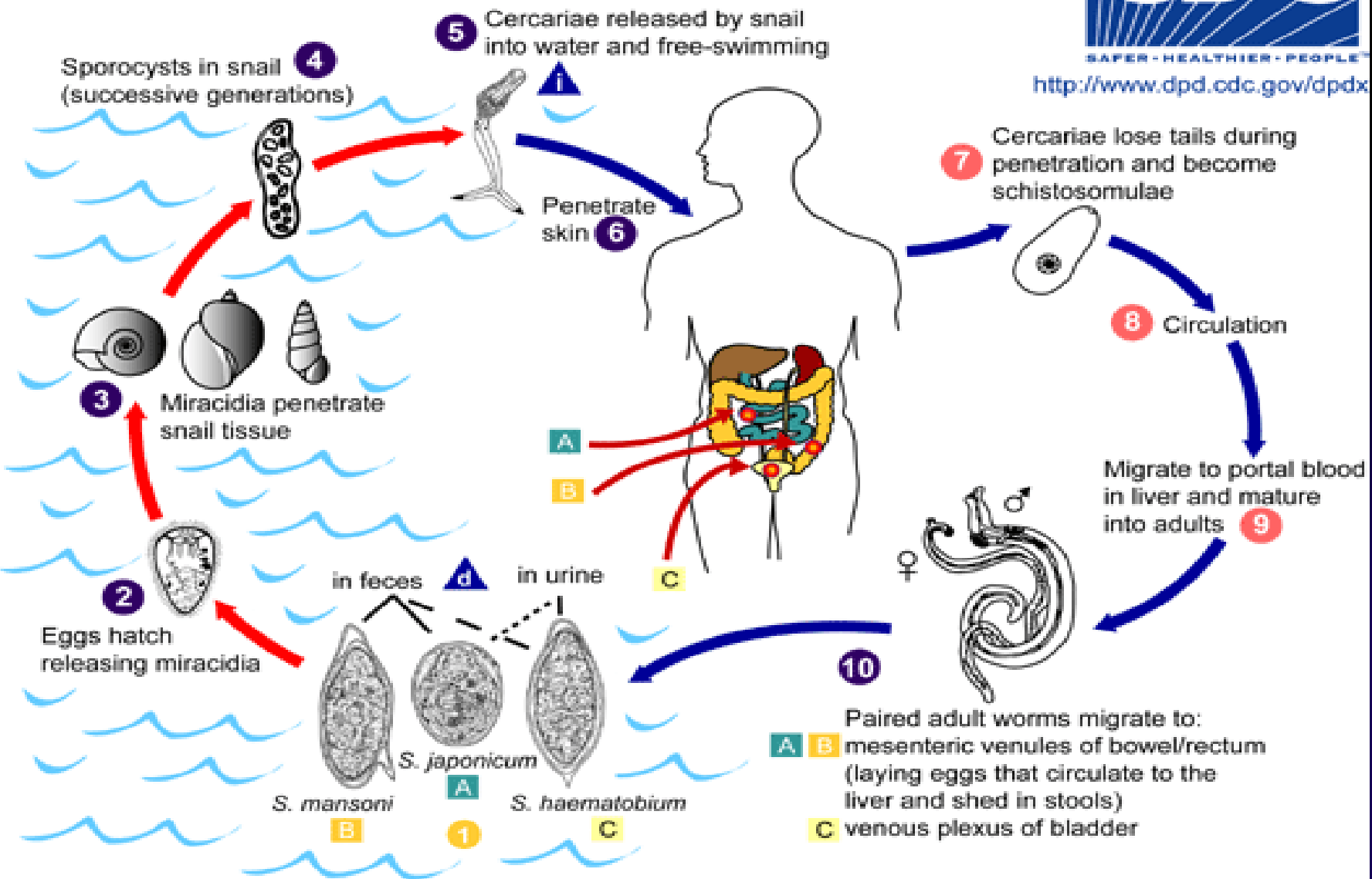
Trematoda

Class Trematoda:



- Trematodes are commonly referred to or commonly called as flukes. Flat and broad look like leaf of tree or flatfish (the name flukes comes from here).
- All are hermaphrodite (monoecious) except *Schistosoma* in which sexes are separated (dioecious).
- According to the sites they inhabit, there are four groups of flukes (**blood flukes, intestinal flukes, liver flukes and lung flukes**)
- All of them are parasitic and pathogenic flatworms.
- No cavity, not segmented Bilaterally flattened except genus *Schistosoma* is cylindrical .
- Body has 2 oral & ventral suckers (except some species have 3rd genital sucker).
- Oral suckers Situated anteriorly sometimes supported by hooks.
- Ventral sucker on ventral side for attachment and fixation.
- The all interior is occupied by the reproductive system; the organism is capable of producing huge numbers of eggs.
- Life cycle: all have indirect life cycle, so all trematodes are parasites of mollusks (snails) and vertebrates.

i = Infective Stage
d = Diagnostic Stage



Life cycle

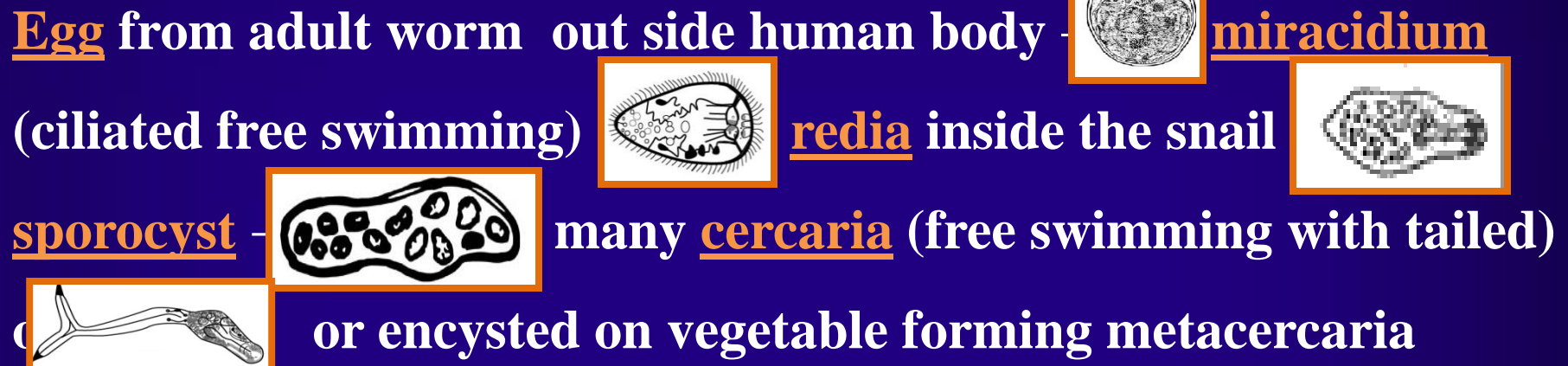


All have indirect needs so all trematodes are parasites of mollusks snails as (I.H) and vertebrates as final host,

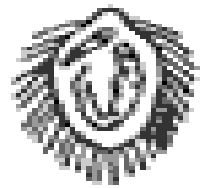
Show sexual stages or adult stages in the (definitive host) and asexual or larval stages in the (I.H.).

Require one or more intermediate host like snail or some fish.

The habitat either in blood called blood flukes or in intestine called intestinal flukes or in the liver called hepatic or liver flukes.



Eggs are ingested by the snail. **2**



Miracidia

2a



Sporocysts

2b



Rediae

2c

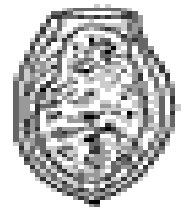


Cercariae

2d

1

Embryonated eggs passed in feces



egg



miracidium

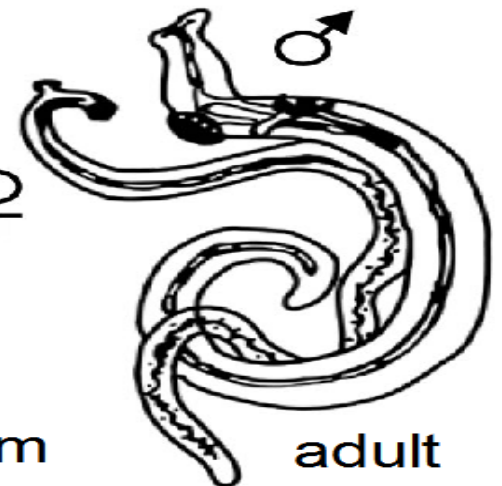


sporocyst



cercarium

♀



adult

Genus *Schistosoma*



- * *Schistosoma*, commonly known as blood-flukes and bilharzia causing schistosomiasis.
- * Adult parasitize and lives in blood vessels.
- * They are dioecious (sexes are separated)
- * All *Schistosoma* has indirect life cycle.
- * It needs I.H(Snail), larval immature stages.
- * It needs human as final host→ adult stage.
- * Male has ventral groove called a gynecophoric canal that extended posterior to the ventral sucker that holds female during copulation.

Genus: *Schistosoma* species



Common name. Blood flukes, Bilharzias worm

- *Schistosoma*, (phylum Platyhelminthes)
- Three pathogenic Spps. to human:

1-*S. haematobium*: causes schistosomal hematuria, vesicle schistosomiasis, and urinary bilharziasis.

habitat: venous plexuses around the urinary bladder.

Intermediate host: snail bulinus

Ova: oval elongated in shape with terminal or polar spine

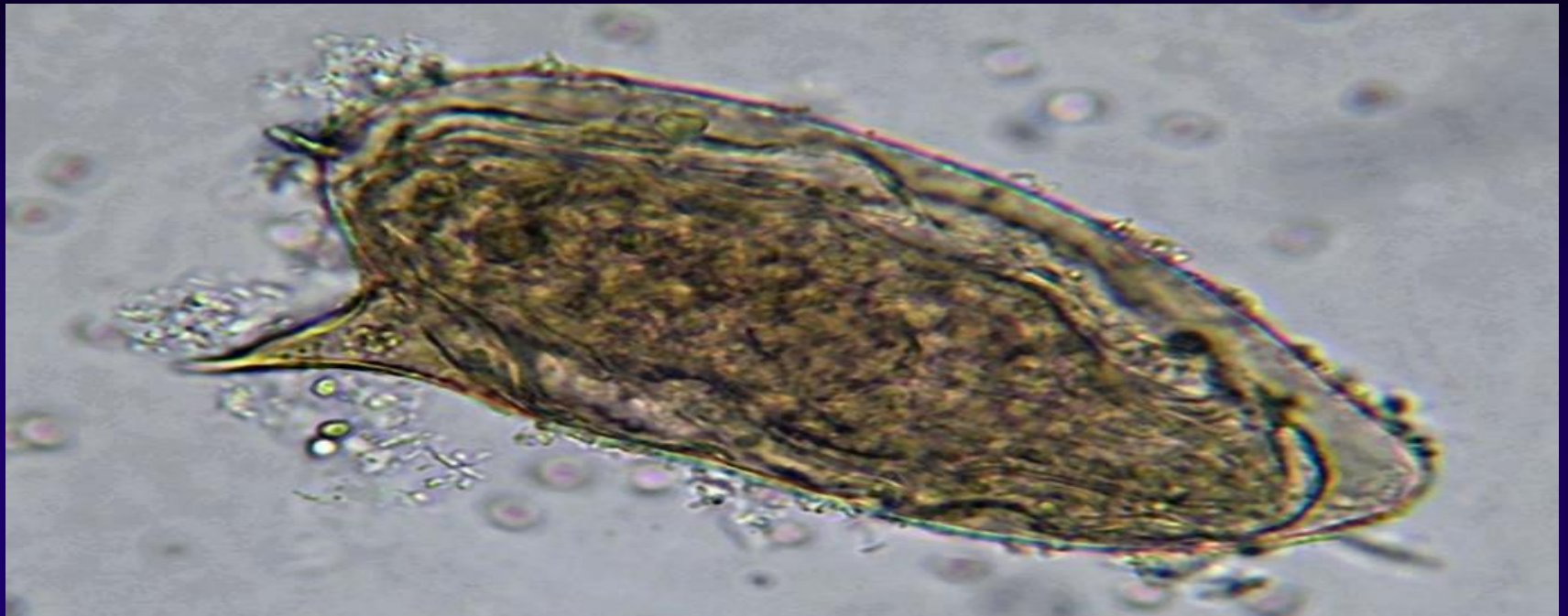


2-*S. mansoni*: causes intestinal bilharziasis, schistosomiasis mansoni.

habitat: inferior mesenteric venules of the intestine.

intermediate host: snail biomphalaria.

ovum: is oval in shape with lateral spine

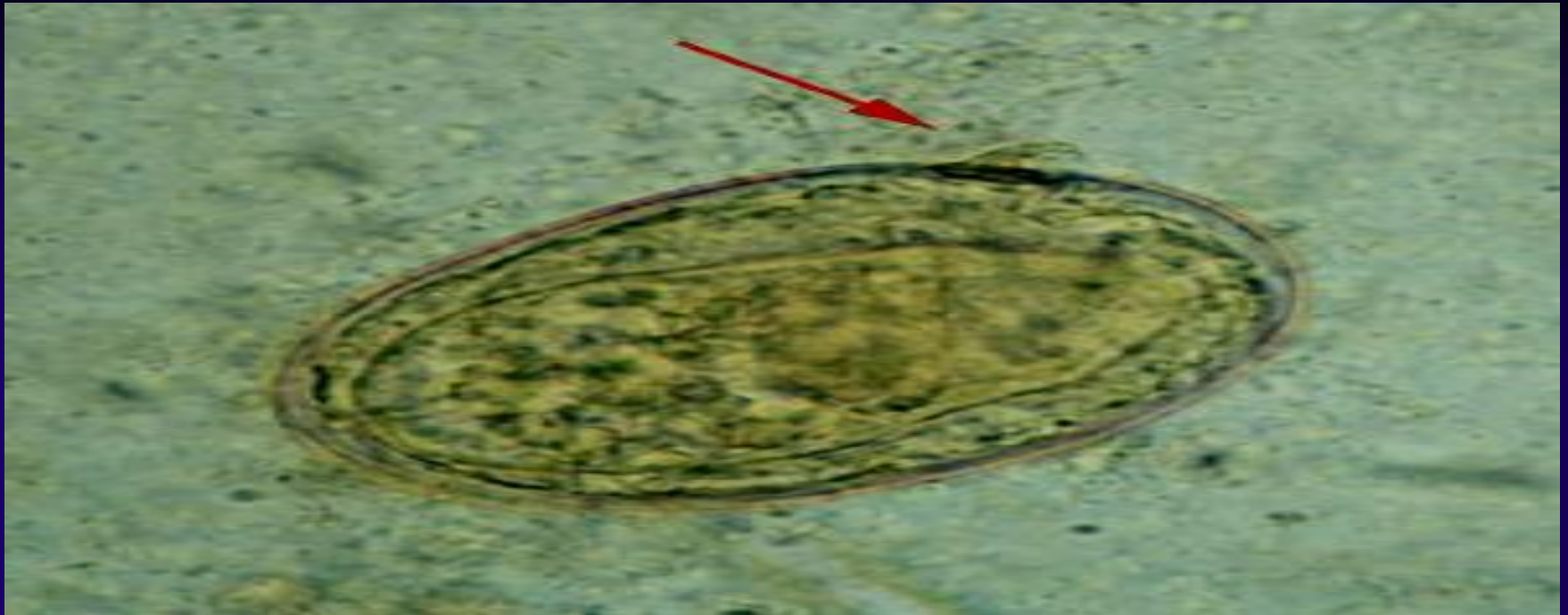


3-*S. japonicum*: causes Oriental schistosomiasis or Katayama disease.

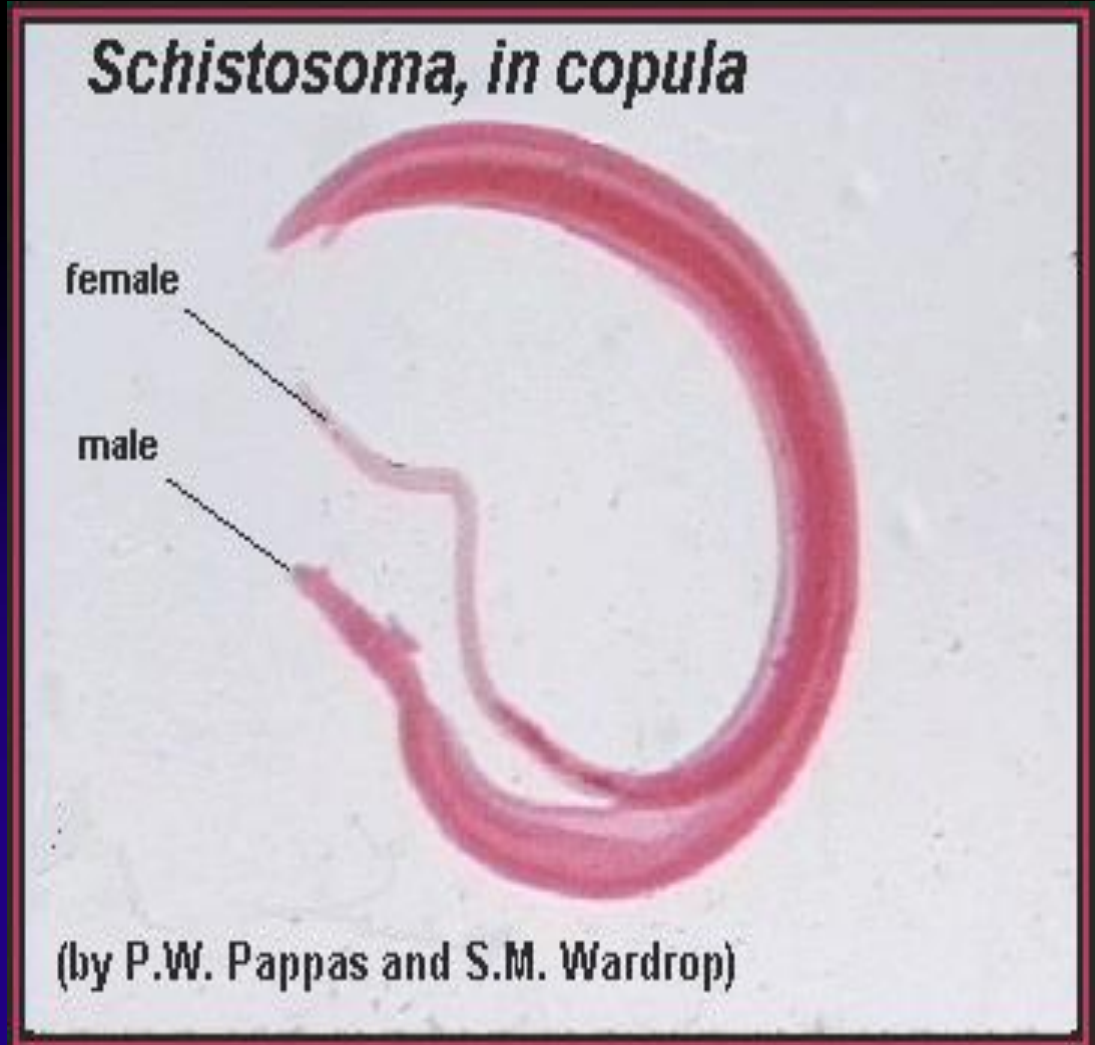
habitat: superior mesenteric venules of the intestine.

intermediate host: snail oncomelania

ovum: is rounded in shape with rudimentary lateral knob



Adults of *Schistosoma*.



General characters of genus schistosoma

These are flukes that reside mainly in the blood vessels of various organs.

Disease: schistosomiasis (bilharziasis).

The schistosoma cause intestinal, hepatic, splenic Etc. schistosomiasis. Schistosoma is dioecious with distinct sexual dimorphism between male and female.

It considered by the (W.H.O.) as the 2nd most important parasitic disease, next to the malaria with hundreds of millions infected worldwide.

Adult worms parasitize and live in blood vessels.

Egg are passed through urine or feces to fresh water, where larva must pass through an intermediate host (snail) in which different larval stage of the parasite emerge that can infect an new human host directly penetrating the skin.

Miracidium



Miracidium (ciliated free swimming, in water, larval hatching from egg Infected the I.H. snail and developed inside to 2 sporocysts and form Cercaria which is biforked tailed and infected to human .



Schistosoma life cycle in general

Schistosoma have vertebrate - invertebrate life cycle, with human (definitive host).

Parasite egg is released into the environment from infected individuals (with urine or stool) hatching on contact with fresh water to release the free swimming miracidia infect freshwater snail by penetrating the snail foot.

After infection miracidium transforms in to sporocyst tha produced cercaria with biforked tail which are larvae capable of infecting mammals and human.

Cercariae emerge daily from the snail host dependent temperature and light.

Penetration of the human skin occurs after the cercaria have attached to explored the skin.

The parasite secretes enzymes that break down the skin's protein to enable penetration of the cercarial head through the skin.

The cercaria penetrates the skin it transforms into a migrating schistosomula stage.

The schistosomula may remain in the skin for two days before locating a post-capillary venule.

From here the schistosomula travels to the lungs where it undergoes further development changes necessary for subsequent migration to the liver.

Adult worm pairs of *S. mansonia* and *S. japonicum* relocated to the mesenteric or rectal veins.

Parasites reach maturity in six to eight weeks, at which time they begin to produce eggs.

Worm pairs can live in the body for an average of four and a half years, but may persist up to twenty years.

Schistosoma haematobium



Common name: Urinary blood flukes.

*** Disease :** Schistosomal hematuria, vesicle schistosomiasis,
and urinary B.

Infective stage : Bi-forked tail cercaria.

Mode of infection : skin penetration.

Intermediate host: Snail called *Bulinus spp.*

Final or definitive host : Human.

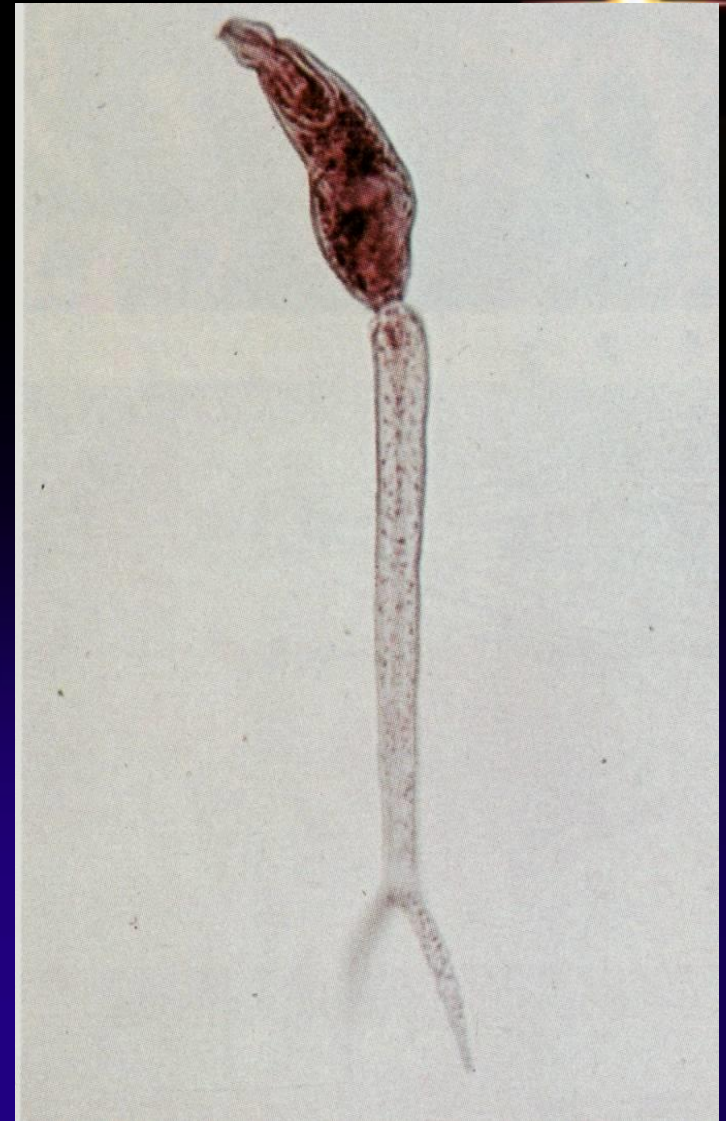
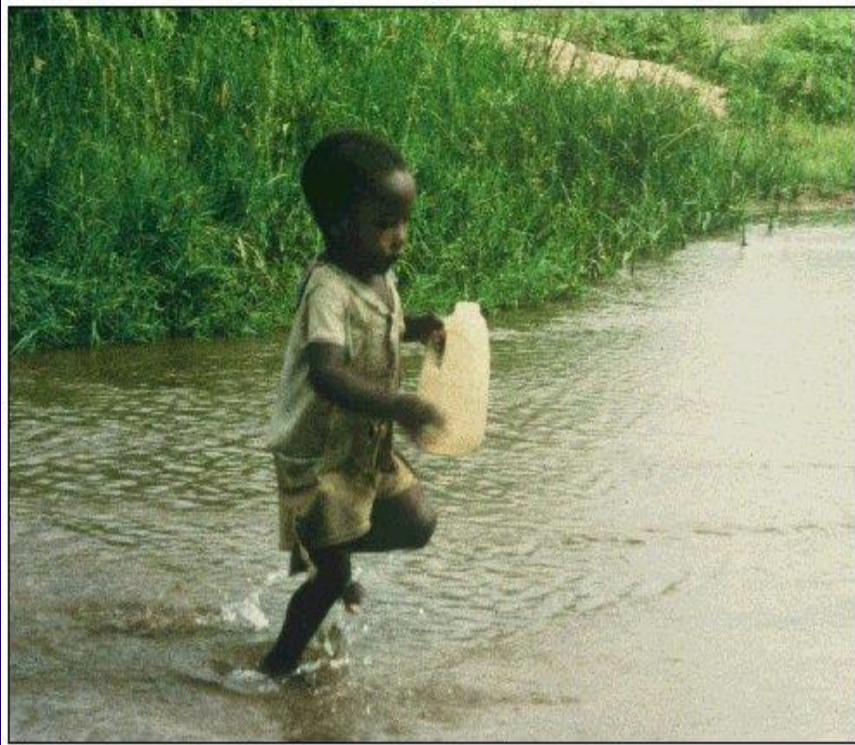
Habitat : Venous or vesicle plexus of urinary bladder.

Egg : Oval in shape with terminal spine.

Diagnostic stage: ova with terminal spine in urine



↑↑contact
water↓↓



Bifurcated tailed cercaria

Symptoms and Diagnosis



Symptoms:

- **Penetration of cercaria causes transient dermatitis (swimmers itch) due to physical damage to the skin by proteases and other toxic substances secreted by the cercaria.**
- **(Painless haematuria) from ulcer of the U.Bladder.**
- **U.Bladder wall may be thickened.**
- **Difficulty in urination and frequent urination**

• In females, vulva, vagina, cervix, ovaries, may be infected & inflamed.

• The loss of blood can lead to iron deficiency anemia.

• A large percentage of persons, especially children, who are moderately to heavily infected experience **urinary tract damage** that can lead to **blocking of the urinary tract** and **bladder cancer**.

• Secondary infections, kidney damage, and even cancer

• Diagnosis: **GUE** for Detection of ova specially in last few drops of urine.

Prophylaxis



- **Prevention of pollution of H₂O in rivers with human urine.**
- **Eradication of I.H. (Mollusks).**
- **Avoiding swimming or washing, or bathing in or contact with infected or polluted water.**
- **Decrease the infected person by medical drugs.**
Treatment.



- **Diagnosis:**

- In laboratory
- Detection of ova in last few drops of urine(specially in morning, after doing some exercises)
- Immunodiagnosis like **ELISA**, **IHT**, **RIA**, and **CFT**.
- Biopsy from infected organ

- **Treatment**

- praziquantel is the drug of choice for treatment.
- Praziquantel is effective against all forms of schistosomiasis and has few side effects. This drug is given in either two or three doses over the course of a single day.



1659 adult *Schistosoma mansoni* worms obtained by live surgical perfusion of an 18 year-old patient in 1970.

Fasciola hepatica (Liver fluke)

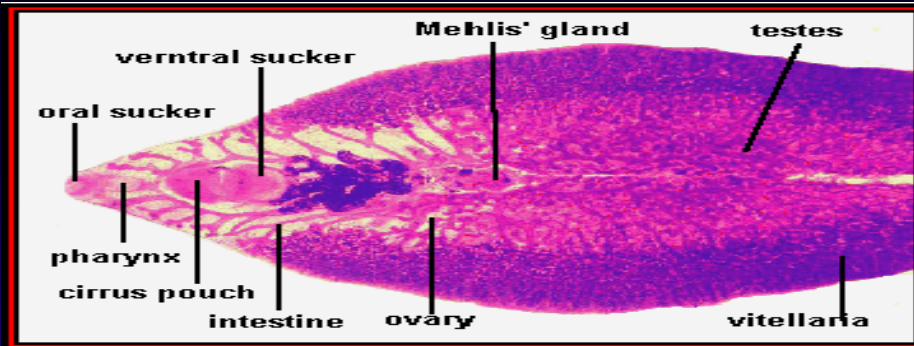


- *Fasciola hepatica* ro **ekulf revil** nommoc eht sa nwonk osla ‘
.ekulf revil peehs
- It is a **parasitic flatworm** of the **class Trematoda**, **phylum Platyhelminthes** that infects liver of various **mammals**, including humans .
- The disease caused by the fluke is called **fascioliasis** (also known as fasciolosis). Or **liver rot**
- *F. hepatica* is distributed worldwide and causes great economic losses in sheep and cattle.
- It is **Hermaphrodite (Monoecious)**.
- **Two suckers (Oral, Ventral)**.
- The adult is leaf-like dorso-ventrally flattened

Fasciola hepatica (Adult and ova)



Operculum ↓↓

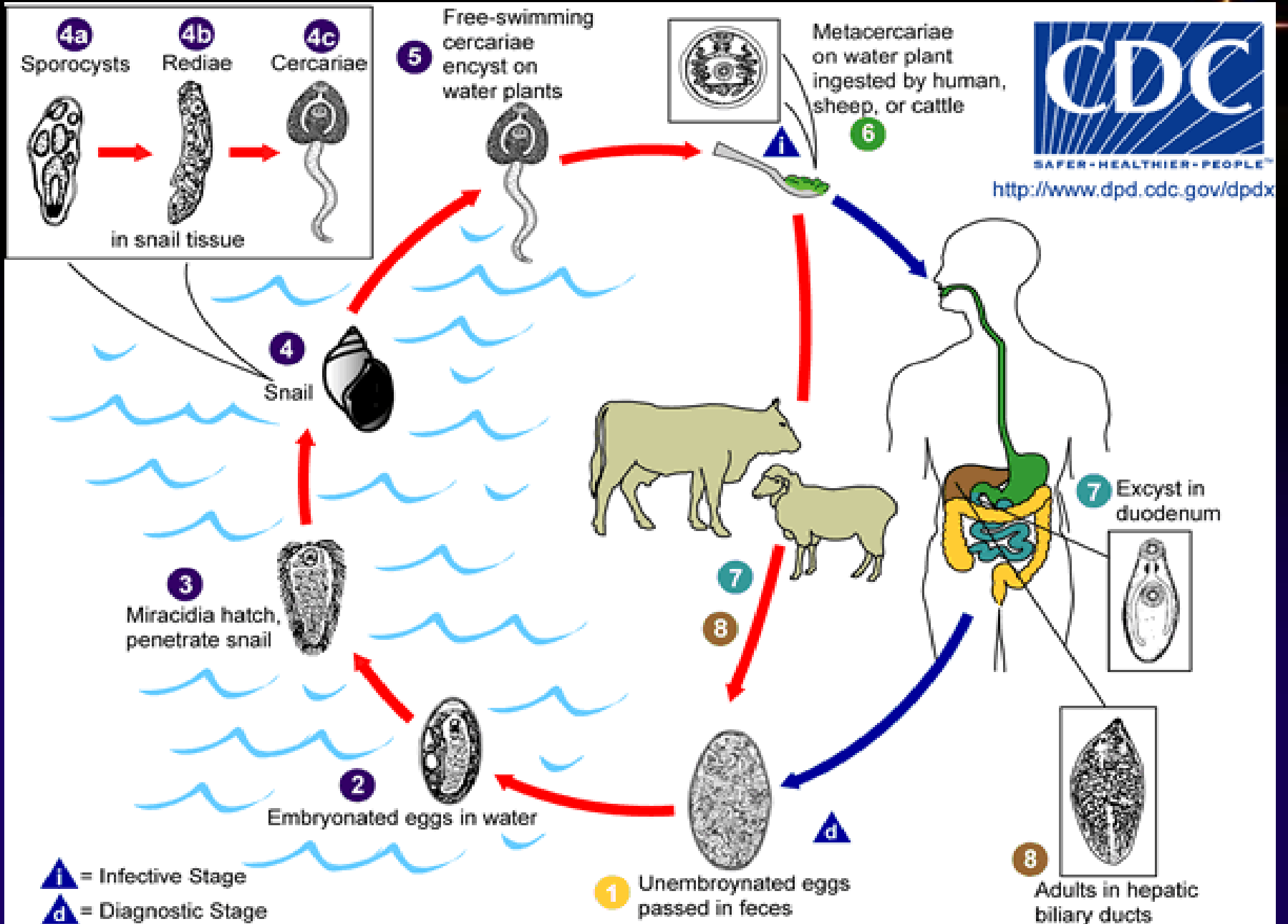


Adult



Ova of *F.hepatica*





Symptoms

Acute fascioliasis



- In its severe form and its occurs in sheep but rarely in man and requires large numbers of parasites. Large numbers of migrating larvae invade the liver and cause a traumatic hepatitis that is frequently fatal .
- Sometimes the liver capsule may rupture into the peritoneal cavity, causing death from peritonitis.
- More usually the invasive phase lasts many weeks, with the most common symptoms being intermittent fever, hepatomegaly, and abdominal pain
- Other symptoms include wasting. Urticaria and eosinophilia are usual.

Chronic fascioliasis



- After reaching the liver, there is then a latent phase lasting months or even years, when infection is asymptomatic.
- with maturation there may be an obstructive phase causing hepatitis, cholangitis, or pancreatitis.
- *Fasciola* evitinifed a sa nam gnisu ot detpada ton si .pps ‘snoitcefni cipotce esuac yam sekulf eht os dna tsoh yeht erewh seussit suoenatucbus dna sgnul eht ni yllaicepse .stsysc mrof yam
- Halzoun is one such type of infection following consumption of raw liver. There is severe pharyngitis ‘infestation of the larynx

Investigations



- It will show eosinophilia and probably anaemia. Eosinophilia occurs in 95 % in the **acute phase** but may be variable in the chronic disease.
- About 50 % have an elevated **erythrocyte sedimentation rate (ESR)**
- **Stool** microscopy may show the pathogen or the **eggs**.
- Various immunoassays are available and enzyme-linked immunosorbant assay (ELISA) tests are very sensitive and specific .
- They may turn positive before microscopy of the stool but they may give false positives based on past rather than current infection.



- **X-ray of the liver may show tract-like small abscesses and sub capsular lesions.**
- **Ultrasound of the gallbladder and biliary tract may show adult worms as focal areas of increased echogenicity.**
- **Cholangiography may reveal multiple cystic dilatations of the ducts.**

Management



- Management
- Non drug
- Bed rest and a protein-rich diet are recommended. Iron and vitamins may be required.
- Drugs
- **Praziquantel** is recommended only if bithionol or triclabendazole is unavailable
- Surgical Parasite removal at **endoscopic retrograde cholangiopancreatography**(ENCP) is effective in the biliary stage.
- **Ascending cholangitis** may require surgery