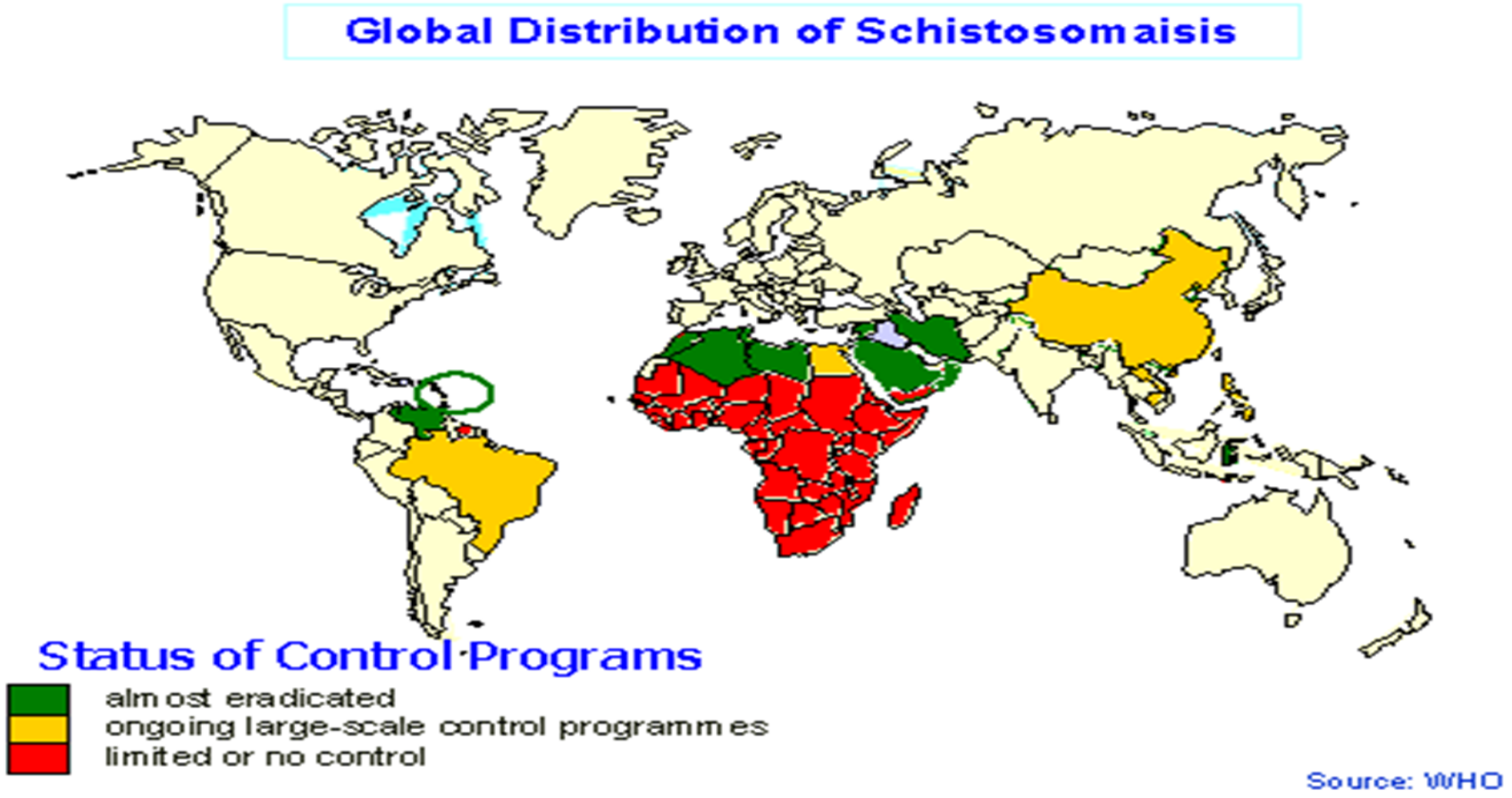
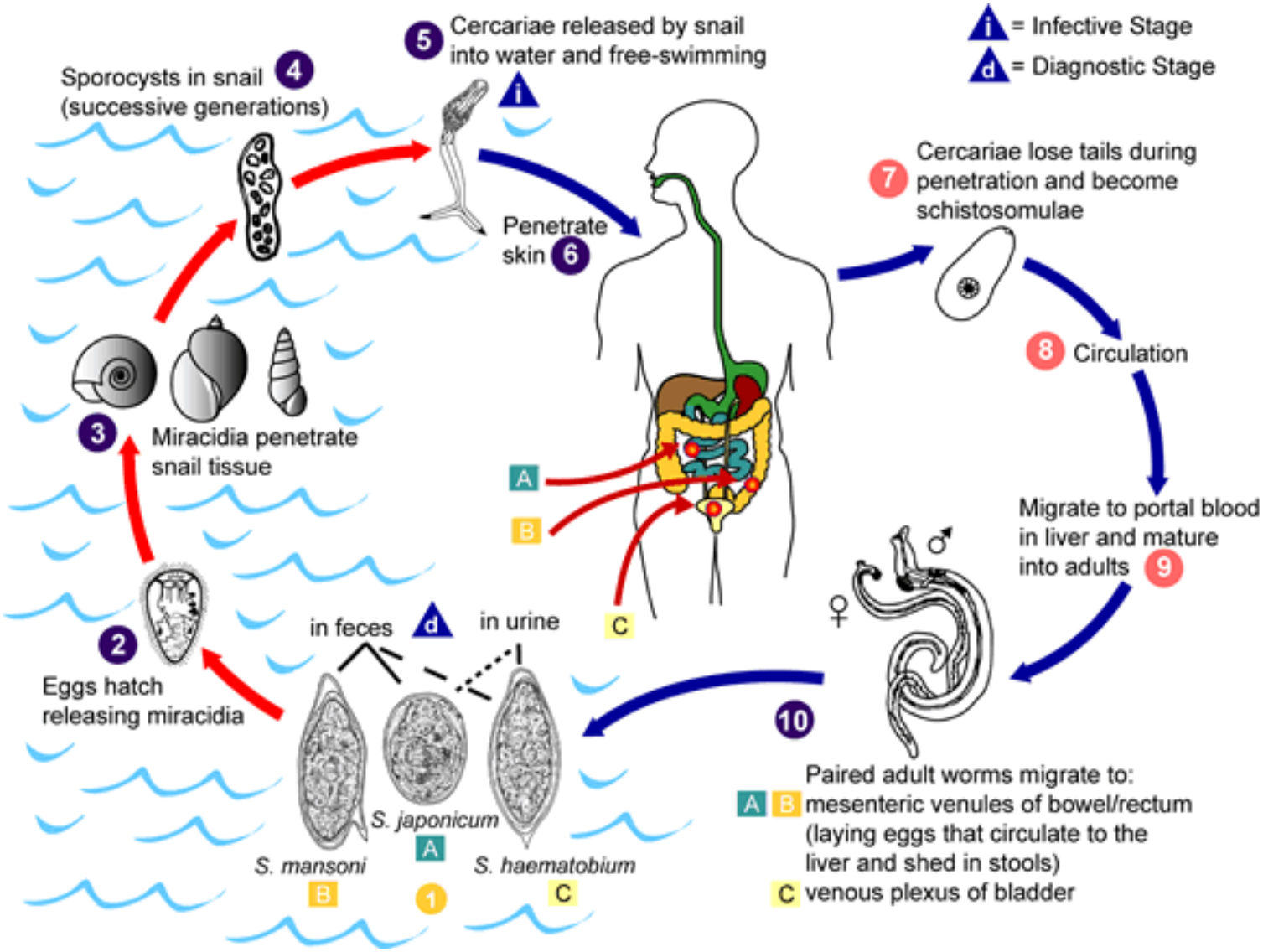
The Trematodes

PROTOZOA	HELMINTHS
Unicellular Single cell for all functions	Multicellular Specialized cells
1. Amoebae: move by pseudopodia. 2. Flagellates: move by flagella. 3. Ciliates: move by cilia. 4. Apicomplexa (Sporozoa) tissue parasites.	Round worms (Nematodes) - elongated, cylindrical, unsegmented. Flat worms - Trematodes: leaf-like, unsegmented. - Cestodes (Tapeworms): tape-like, segmented.

Blood Flukes

Schistosoma spp.





Life cycle of *Schistosoma spp.*

Schistosoma spp.

CERCARIA IS THE INFECTIVE STAGE.

Cercaria emerge from snail in the water and penetrate the skin of the human.

The **cercaria** is transformed into **a schistosomula** inside the host tissues.

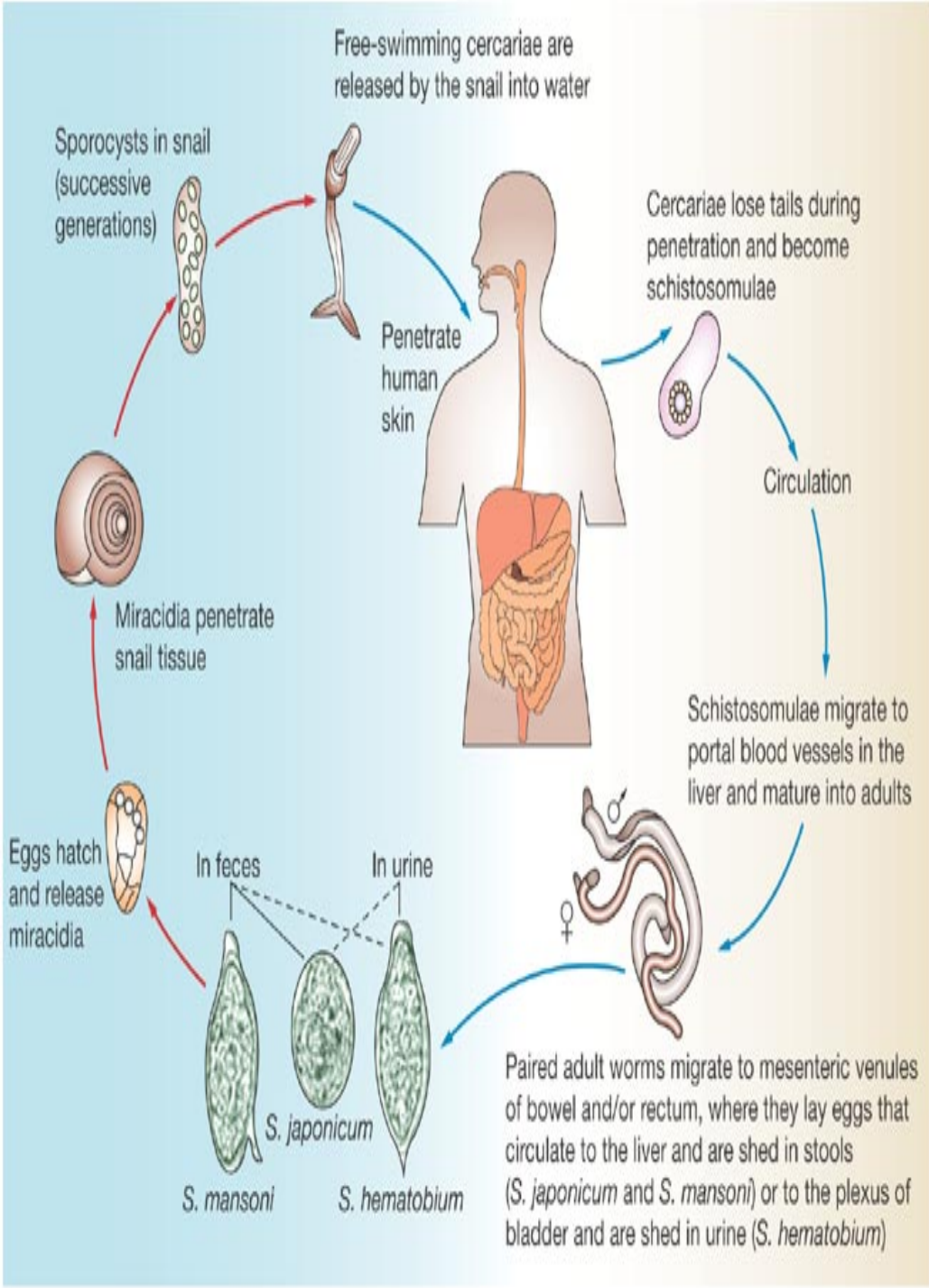
The **schistosomula** first enters the systemic circulation and then finds its way into the portal circulation (*S. mansoni* & *S. japonicum*) worms mature in the **mesenteric veins of the portal circulation**, *S. haematobium* worms generally remain in the systemic circulation and mature in the blood vessels of the **vesical plexus**.

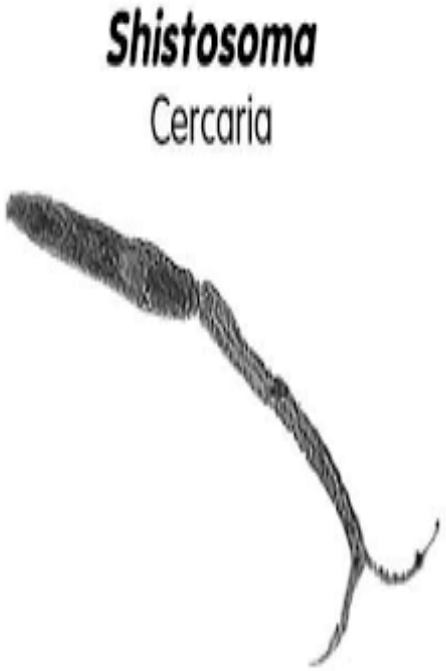
THE EGG IS THE DIAGNOSTIC STAGE.

The eggs of *S. mansoni* & *S. japonicum* are passed mainly in **stool** and *S. haematobium* passed mainly in **the urine**.

PATHOLOGY:

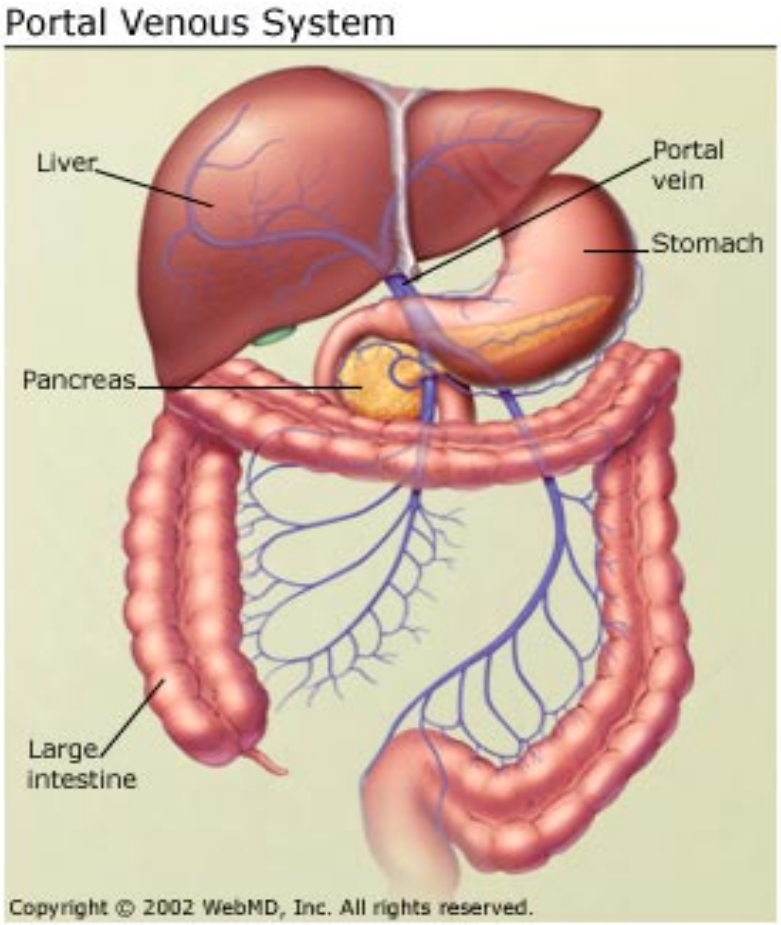
The EGG is the main cause of pathology in schistosomiasis. Many eggs become stranded in the tissues or carried by the blood stream to other organs mainly the LIVER. The host reaction to the eggs may vary from small granulomas to extensive fibrosis. The extent of damage is generally related to the number of eggs present in the tissues.

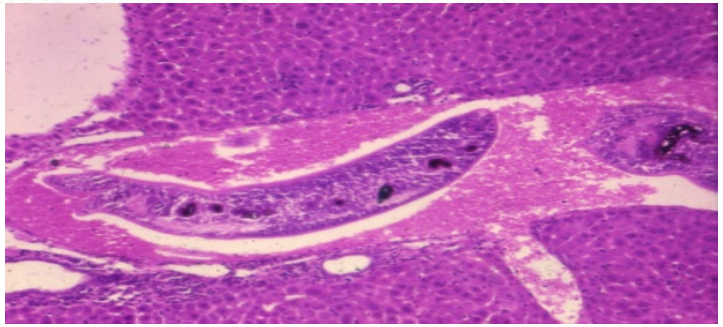




Schistosome dermatitis, or "swimmers itch" occurs when skin is penetrated by a free-swimming, fork-tailed **infective cercaria**. The dermatitis often develops 24 hours after exposure and last for 2 to 3 days and then spontaneously disappears.

Source: WikiMedia.

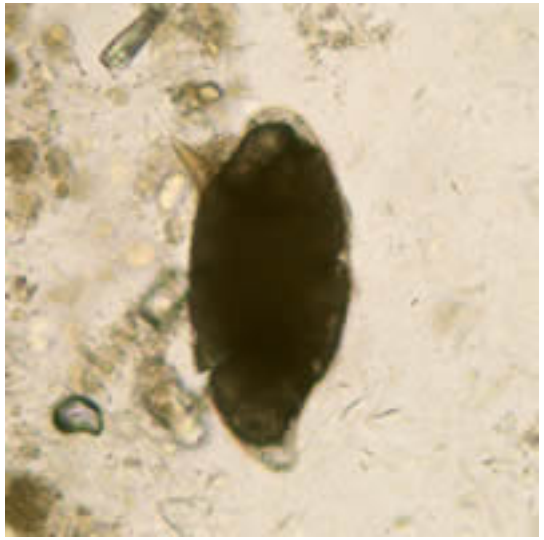




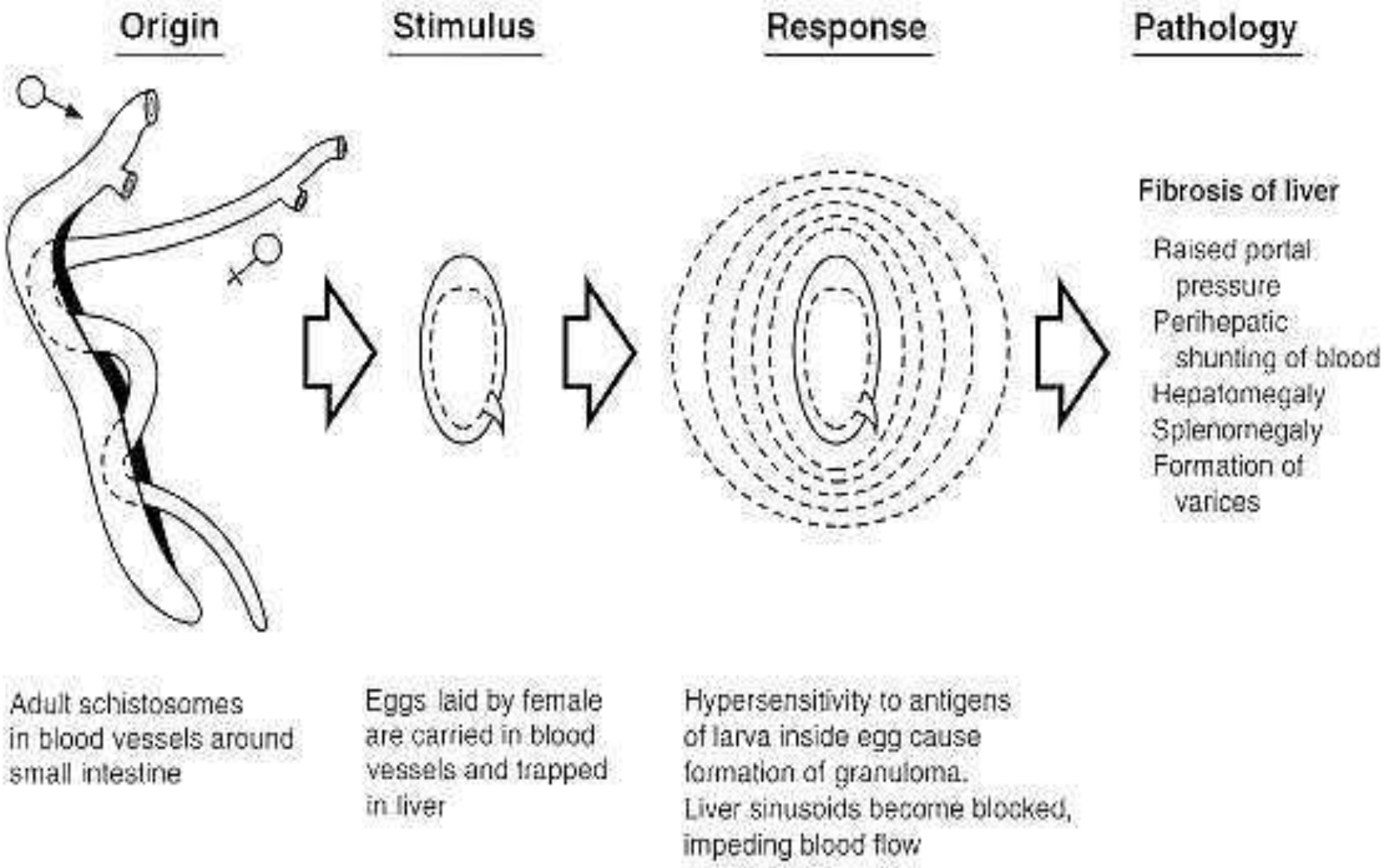
Developing Schistosome in liver:

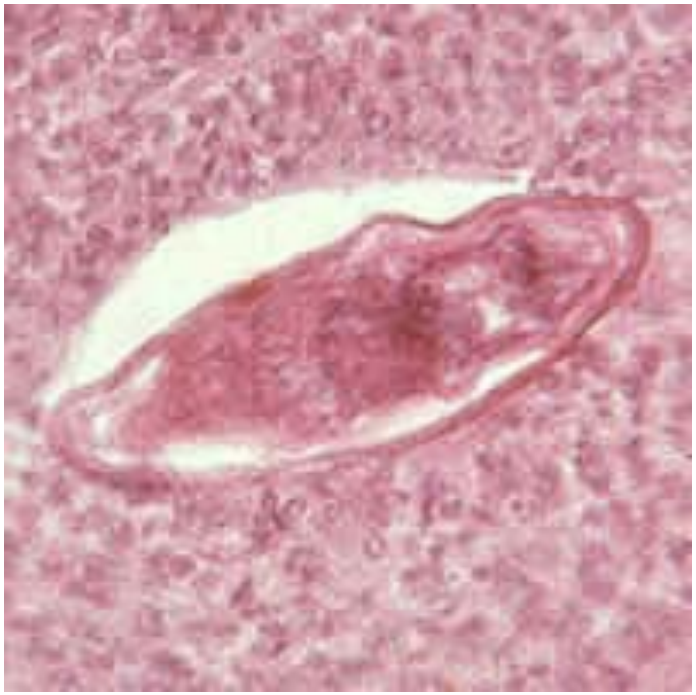
S. mansoni & *S. japonicum* located mainly in **mesenteric vein** and its branches, the worm discharges **EGGS**, the eggs travel in 2 directions: 1- some eggs find their way into the lumen of the bowel and appear in the faeces, 2- other flow with blood stream in the portal circulation and enter **the LIVER**. Most of these eggs are trapped in the liver and give rise to pathology, again some of these eggs find their way through the liver tissue and enter the systemic circulation to another organ as brain, fibrosis of the liver caused from eggs settled in the liver may produce portal hypertension, which may lead to hepatomegaly, splenomegaly esophageal varices and ascites.

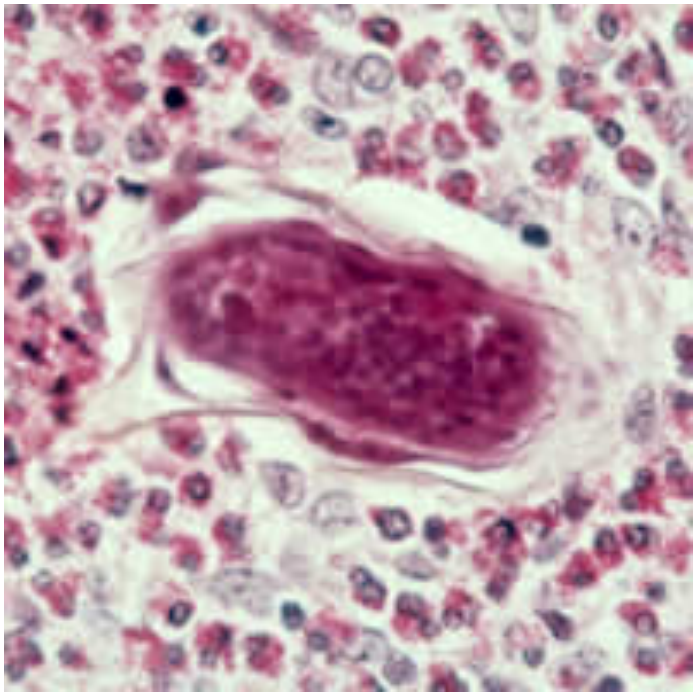




Eggs of ***Schistosoma mansoni*** with lateral spine


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





Eggs of *Schistosoma mansoni* in the liver and cellular reaction.

Hepatomegaly and splenomegaly with ascites.

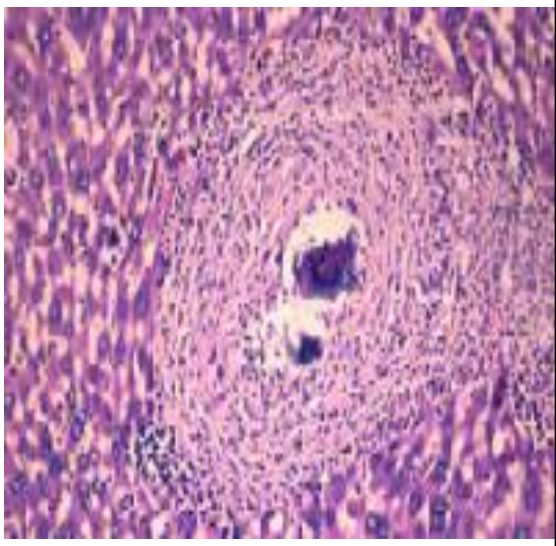
HEPATOSPLENOMEGALY IN CHRONIC SCHISTOMAIASES

***S. haematobium*:**

The worm is located in the vesical venous plexus surrounding the urinary bladder.

Many **eggs** are trapped in the wall of the bladder where they may give rise to calcification and granuloma formation.

Constriction of the orifice of the ureter may produce kidney damage, hydronephrosis and cancer of the bladder.



Pathology of Schistosomiasis

Schistosoma haematobium

Causes urinary schistosomiasis

1. PREPATENT PERIOD 10-12 wks.

2. EGG DEPOSITION AND EXTRUSION:
   1. painless hematuria
   2. Inflammation of bladder and burning micturition
   3. CNS involvement (rare)

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

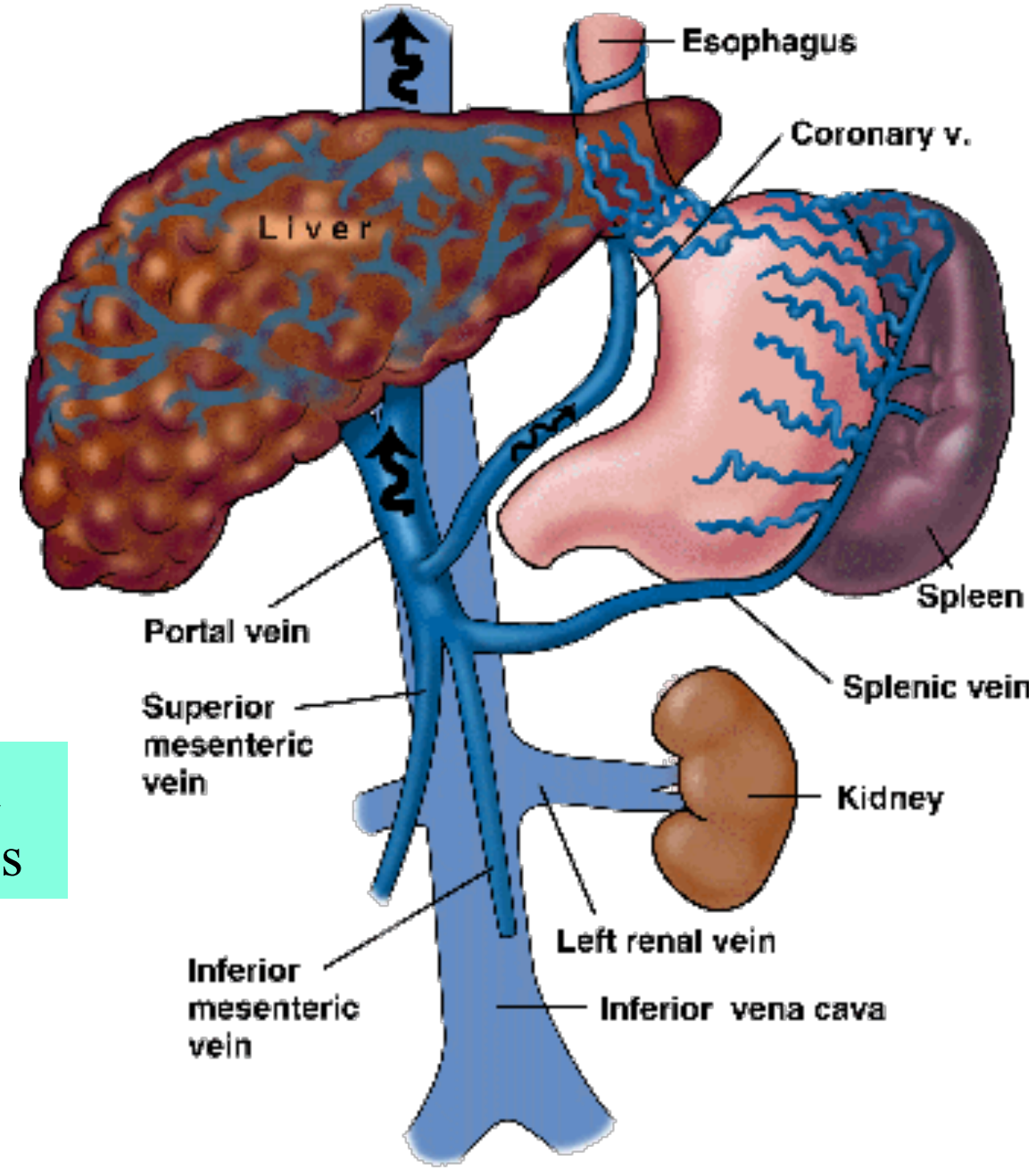
Causes intestinal schistosomiasis

1. PREPATENT PERIOD 5-7 wks.

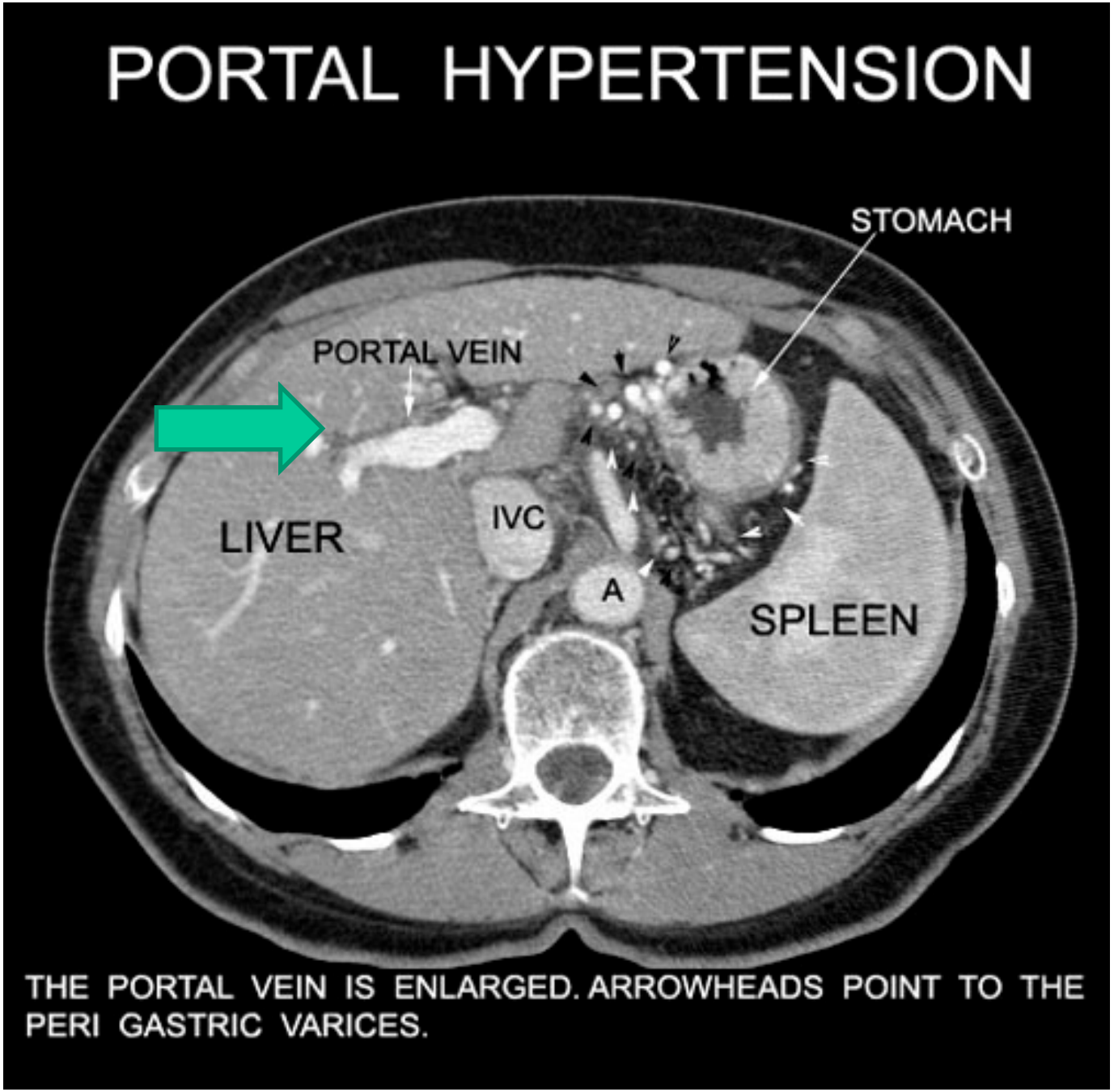
2. EGG DEPOSITION AND EXTRUSION:
   1. dysentery (blood and mucus in stools)
   2. hepatomegaly splenomegaly
   3. CNS involvement (rare)

3. TISSUE PROLIFERATION AND REPAIR:
   - Fibrosis, Papillomata in intestine
   - Periportal fibrosis, hematemesis
   - Lung and CNS involvement

Portal hypertension in chronic schistosomiasis



PORTAL HYPERTENSION



THE PORTAL VEIN IS ENLARGED. ARROWHEADS POINT TO THE PERI GASTRIC VARICES.

Diagnosis of Schistosomiasis

Schistosoma haematobium

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

Schistosoma mansoni

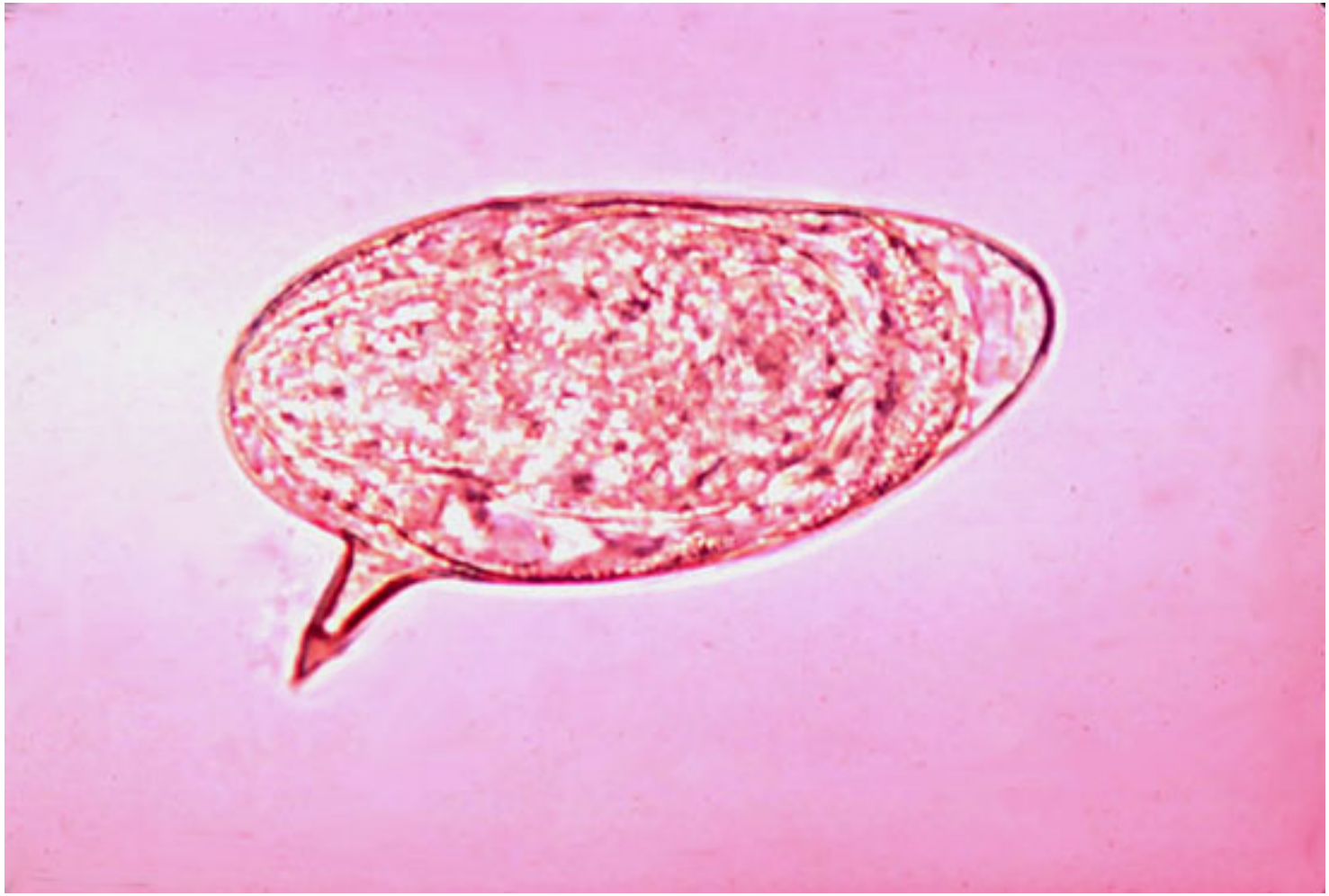
- **Parasitological:**
  - **Examination of stools**
- **Immunological:**
  - **Serological tests**
- **Indirect:**
  - **Radiological**
  - **Endoscopy**

Egg of *S. haematobium*

Egg of *S. japonicum*

Egg of *S. haematobium*

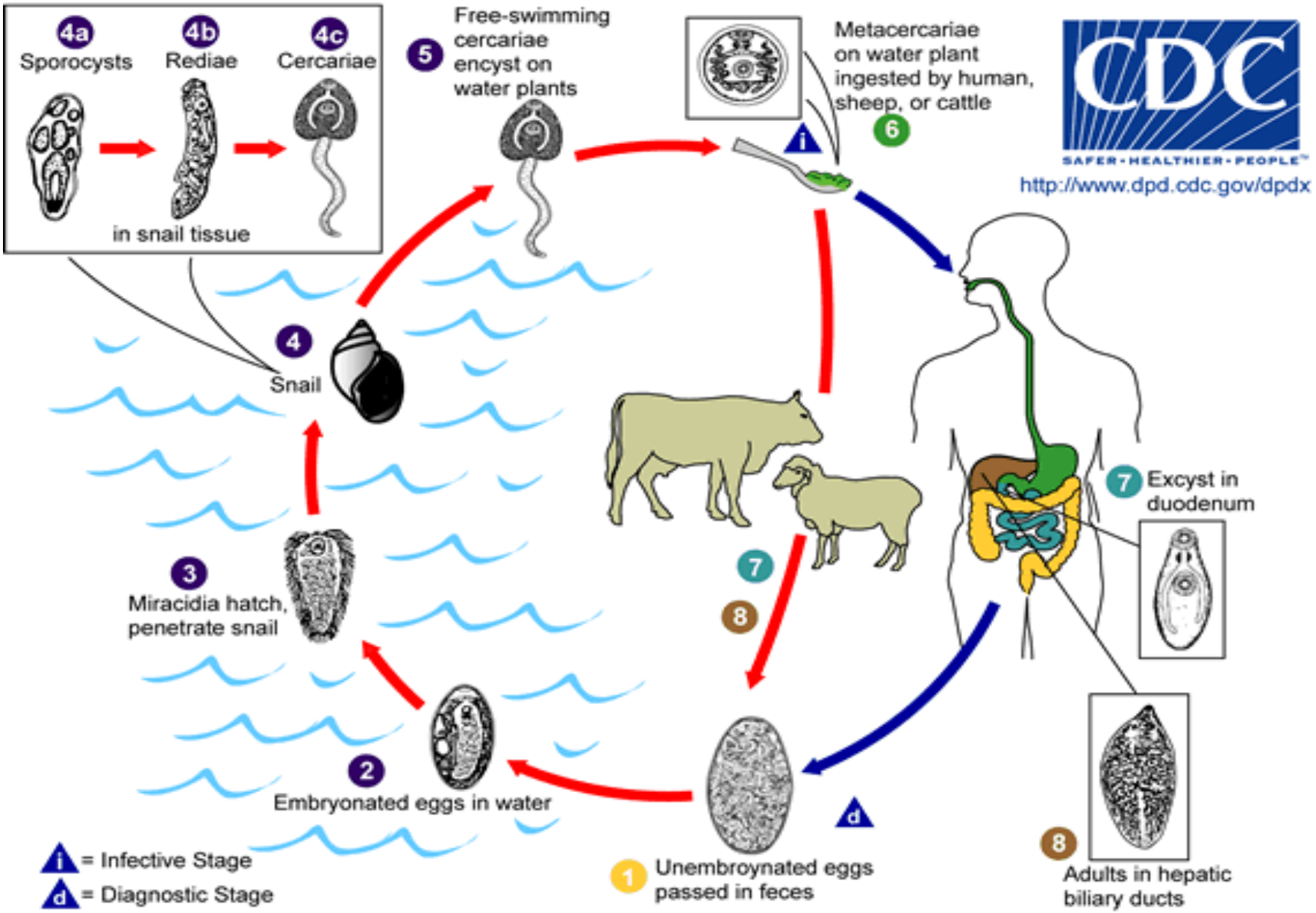
Egg of *S. mansoni*

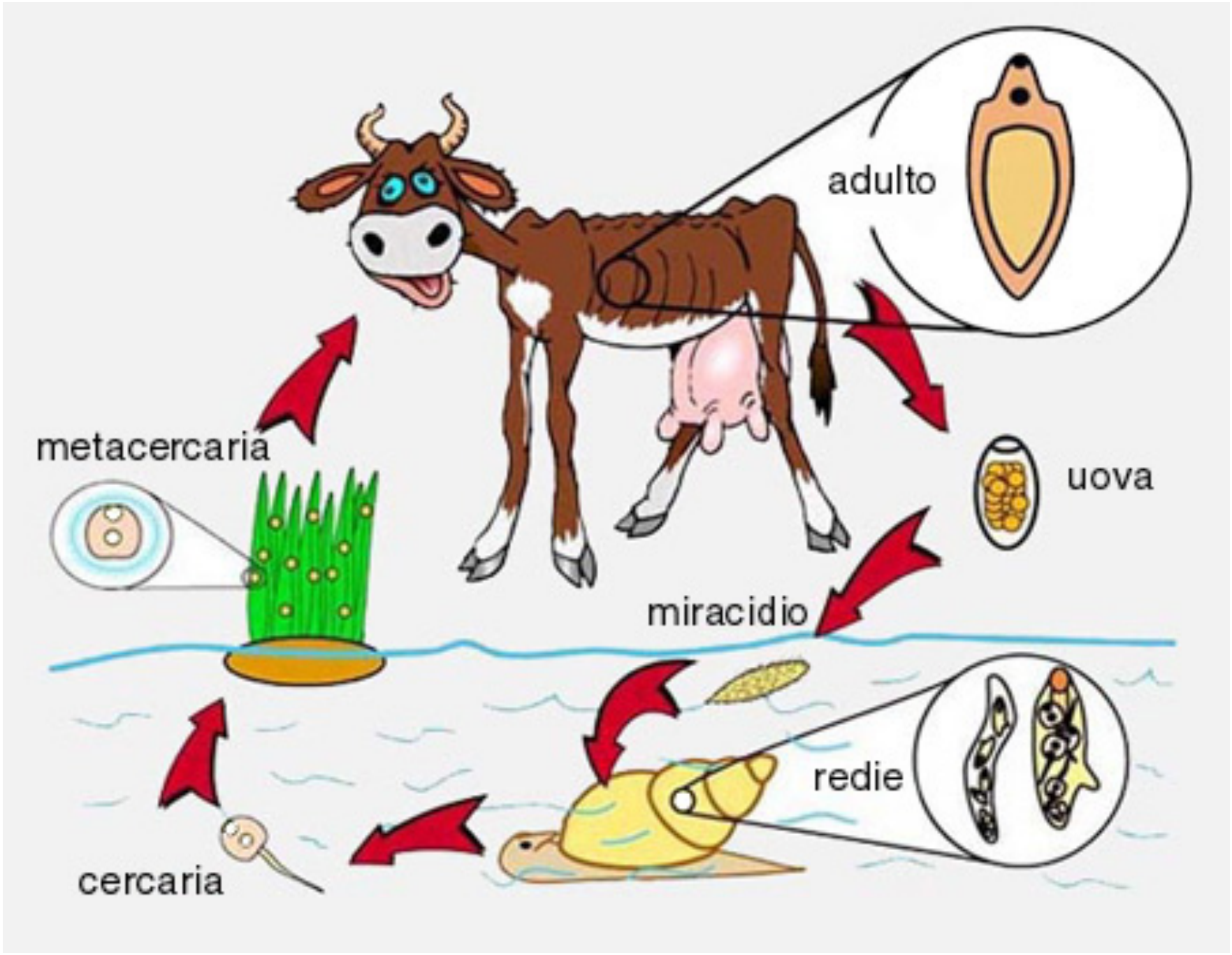


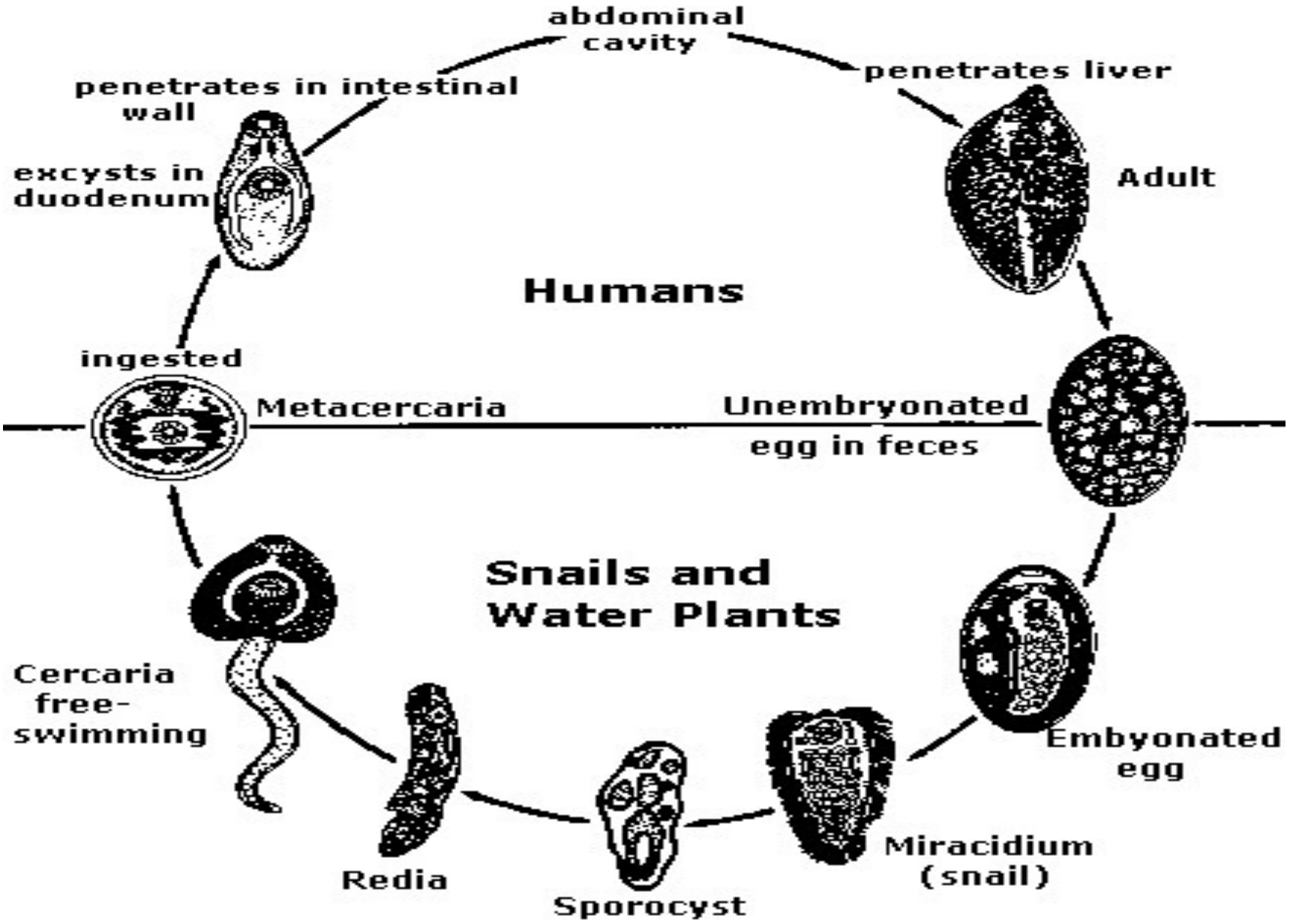
Drug of choice for schistosomiasis is

Praziquantel

Life-cycle of *Fasciola hepatica*




adulto
uova
metacercaria
miracidio
redie
cercaria


abdominal cavity
penetrates liver
penetrates in intestinal wall
Adult
excysts in duodenum
Humans
ingested
Metacercaria
Unembryonated egg in feces
Snails and Water Plants
Cercaria free-swimming
Embyonated egg
Redia
Sporocyst
Miracidium (snail)

Snail

intermediate host of *Fasciola hepatica*

Watercress, one means of transmission of fascioliasis

Fasciola hepatica

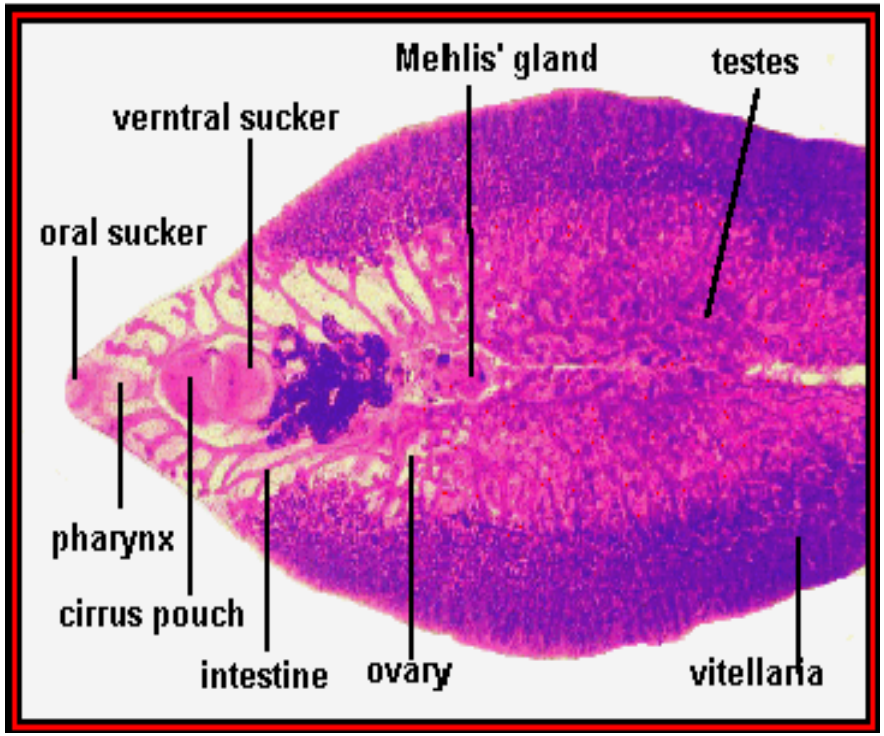
Fasciola hepatica

Egg of *Fasciola hepatica*

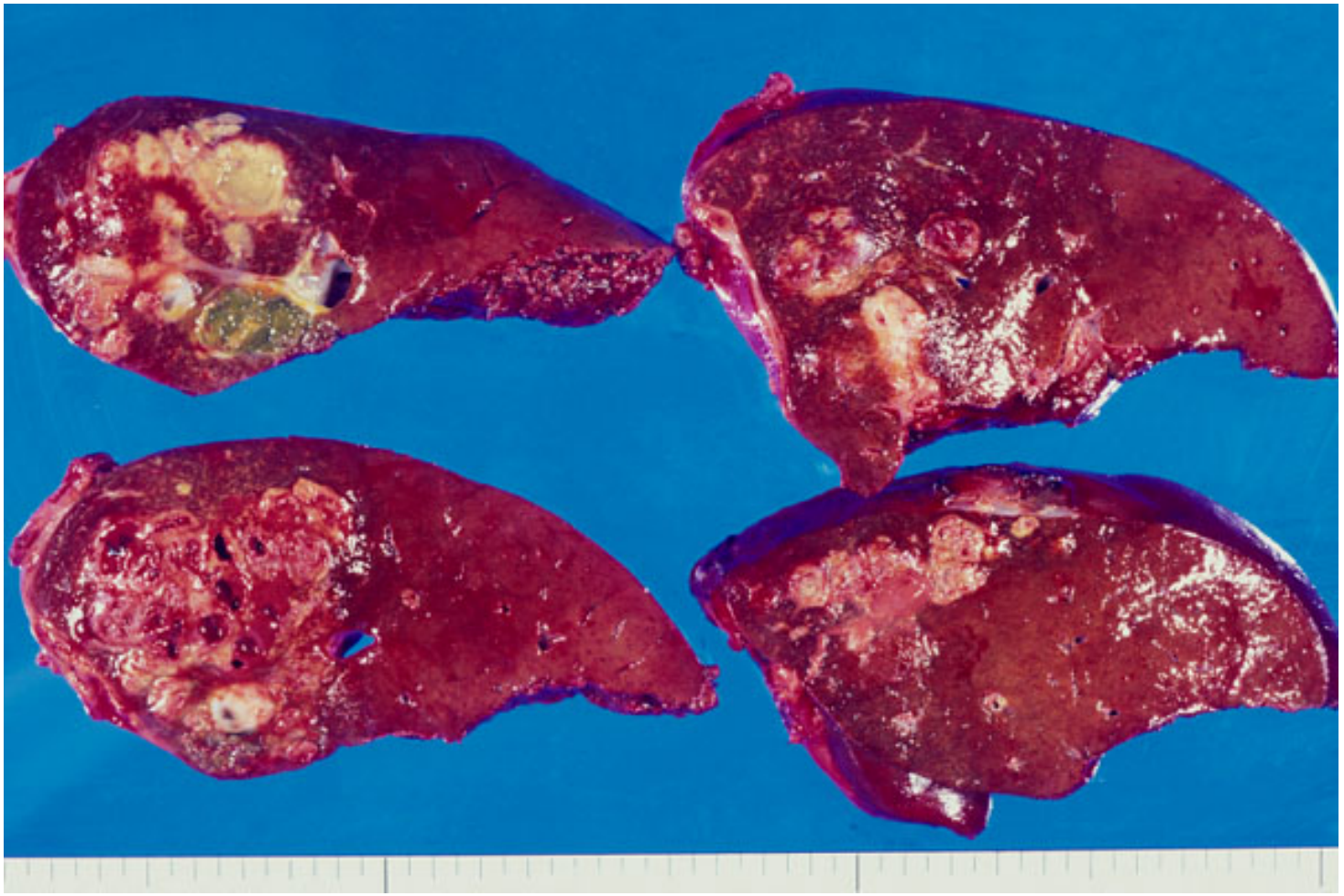
Fasciola hepatica

- Pathology and clinical picture :
  - **True infection:** occur when man accidentally ingests water plant (watercress) contaminated with **METACERCARIA**, the adult worm can causes mainly biliary colic with **biliary obstruction, jaundice,** generalized abdominal pain, cholecystitis.
  - **False infection:** is when eggs are eaten in infected animal liver and passed in stools.
- Diagnosis: eggs in stools or duodenal aspirate.
- Treatment: Triclabendazole.

Fasciola hepatica adult



Fasciola hepatica in bile duct



Sheep liver infected with *Fasciola hepatica*

Fasciola hepatica: spurious infection (false infection) will not lead to liver infection only we can detect eggs in stool

TREATMENT

Triclabendazole is the drug of choice to treat fascioliasis and is on the WHO list of essential medicines.

The correct dosage is calculated based on the person's weight (10 mg/kg) and the tablets are given at one time.