Trematoda, continue

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Medical Parasitology Ⅱ

Summer Semester

Lecture 5

28/08/2025

Trematoda

They are leaf-shaped unsegmented, flat and broad helminths (hence the name fluke, from the Anglo-Saxon word floe meaningflatfish). The name trematode comes from their having la rge prominent suckers with a hole in the middle (Greek trema: hole, eidos: appearance)

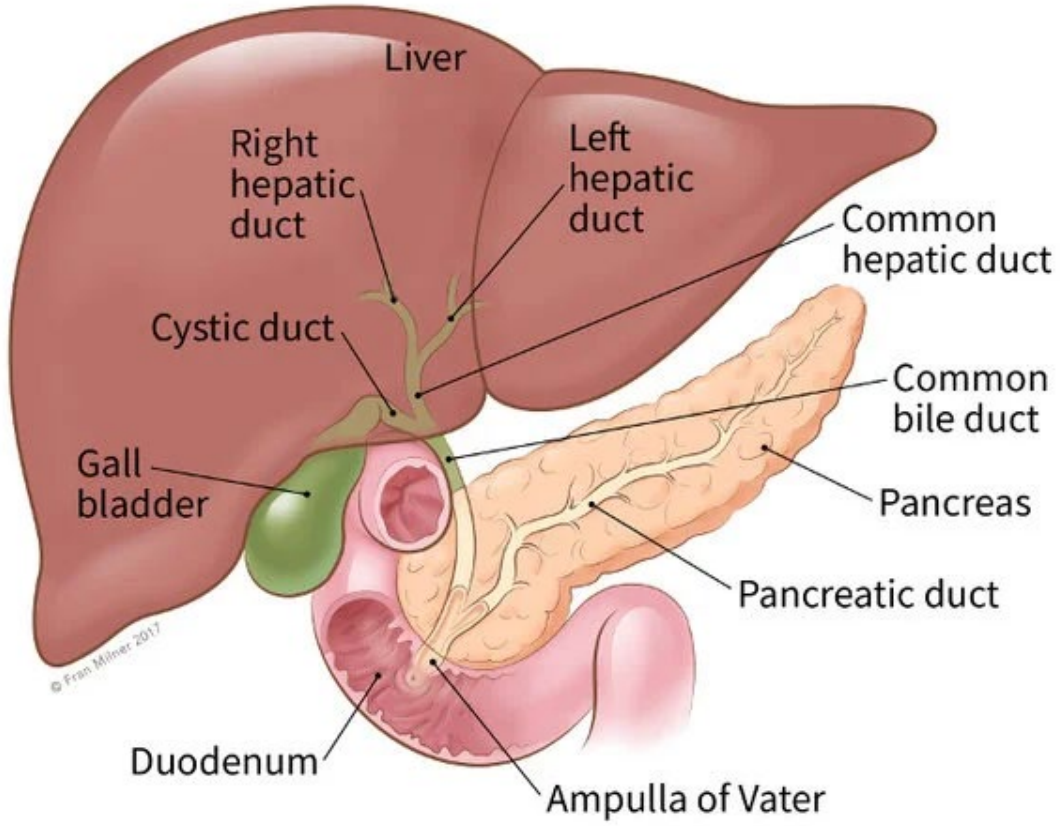
Clonorchis Sinensis

Distribution

Human clonorchiasis occurs in Japan, Korea, Taiwan, China and Vietnam, affecting about 10 million persons.

Habitat

Adult worm lives in the biliary tract and sometimes in the pancreatic duct.



Morphology

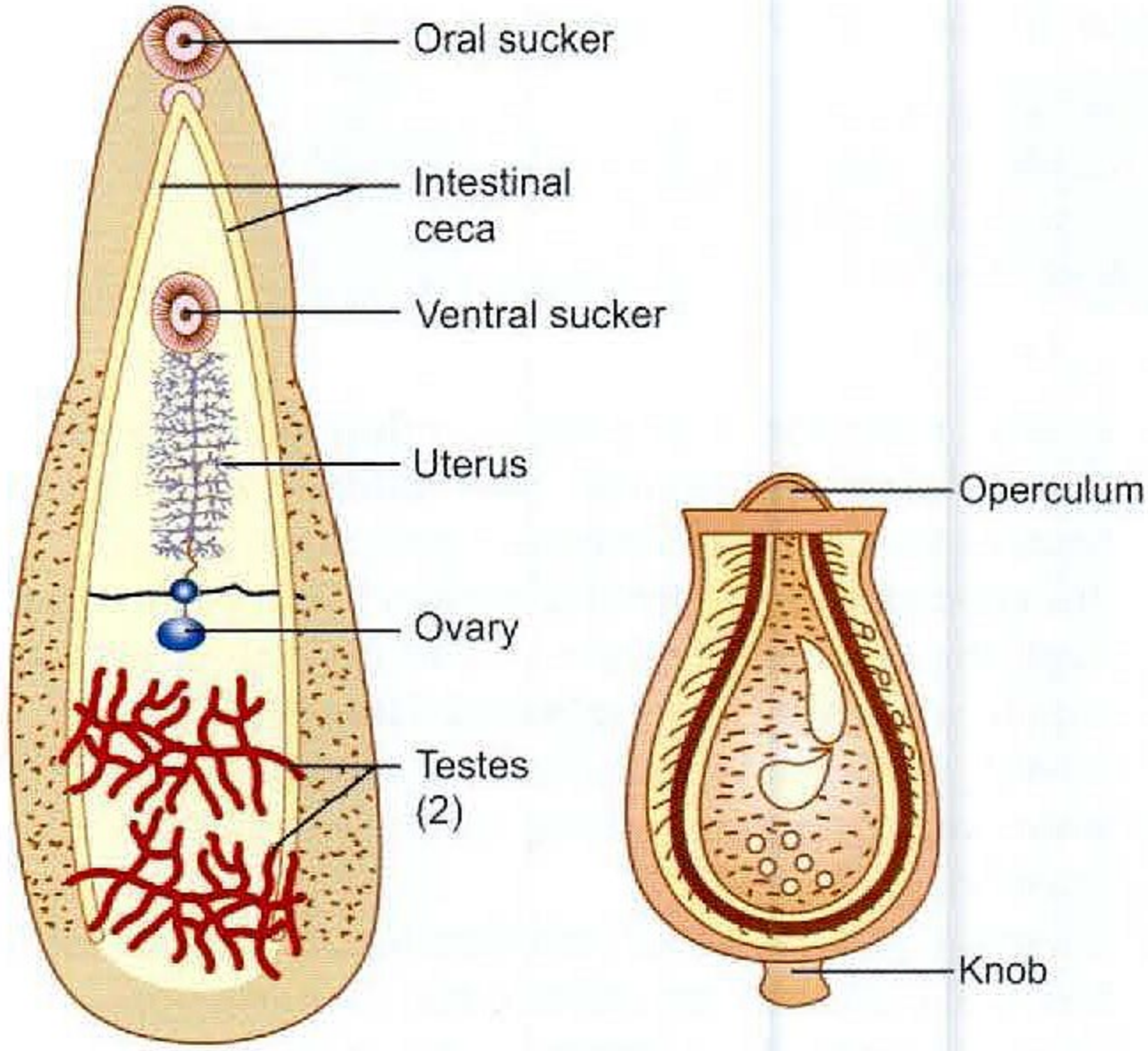
Adult worm: It has a flat, transparent, spatulate body; pointed anteriorly and rounded posteriorly.

- It is 10- 25 mm long and 3-5 mm broad.
- The adult worm can survive in the biliary tract for 15 years or more.
- The hermaphroditic worm discharges eggs into the bile duct.

Eggs

Eggs are flask-shaped, 35 µm by 20 µm, with a yellowish brown (bile-stained) shell.

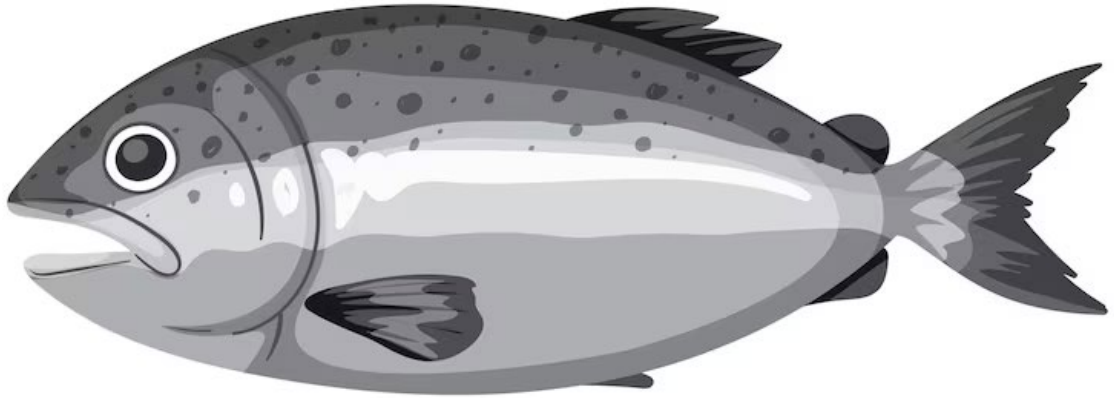
- It is operculated at one pole and possesses a tiny knob at the other pole and a small hook-like spine at the other
- The eggs passed in feces contain the ciliated miracidia.


Oral sucker
Intestinal ceca
Ventral sucker
Uterus
Ovary
Testes (2)
Operculum
Knob

Life Cycle

Definitive host: Humans are the principal definitive host, but Dogs and other fish-eating canines act as reservoir hosts.

Intermediate hosts: Two intermediate hosts are required to complete its life cycle, the first being a snail and the second Being fish.



Life Cycle

- Eggs are passed in human feces into freshwater.
- Miracidia hatch from eggs and infect freshwater snails (first intermediate host), developing into sporocysts → rediae → cercariae.
- Cercariae leave the snail and encyst as metacercariae in freshwater fish (second intermediate host).
- Humans become infected by eating raw or undercooked fish containing metacercariae.
- Metacercariae excyst in the duodenum, migrate to the bile ducts, and mature into adult flukes, completing the cycle.

DPDx

Clonorchis sinensis

CDC

Infective stage

Diagnostic stage

4 Metacercariae in flesh or skin of fresh water fish are ingested by the definitive host.

3 Free-swimming cercariae encyst in the skin or flesh of freshwater fish.

2 Eggs ingested by the snail intermediate host.

Miracidia 2a

Sporocysts 2b

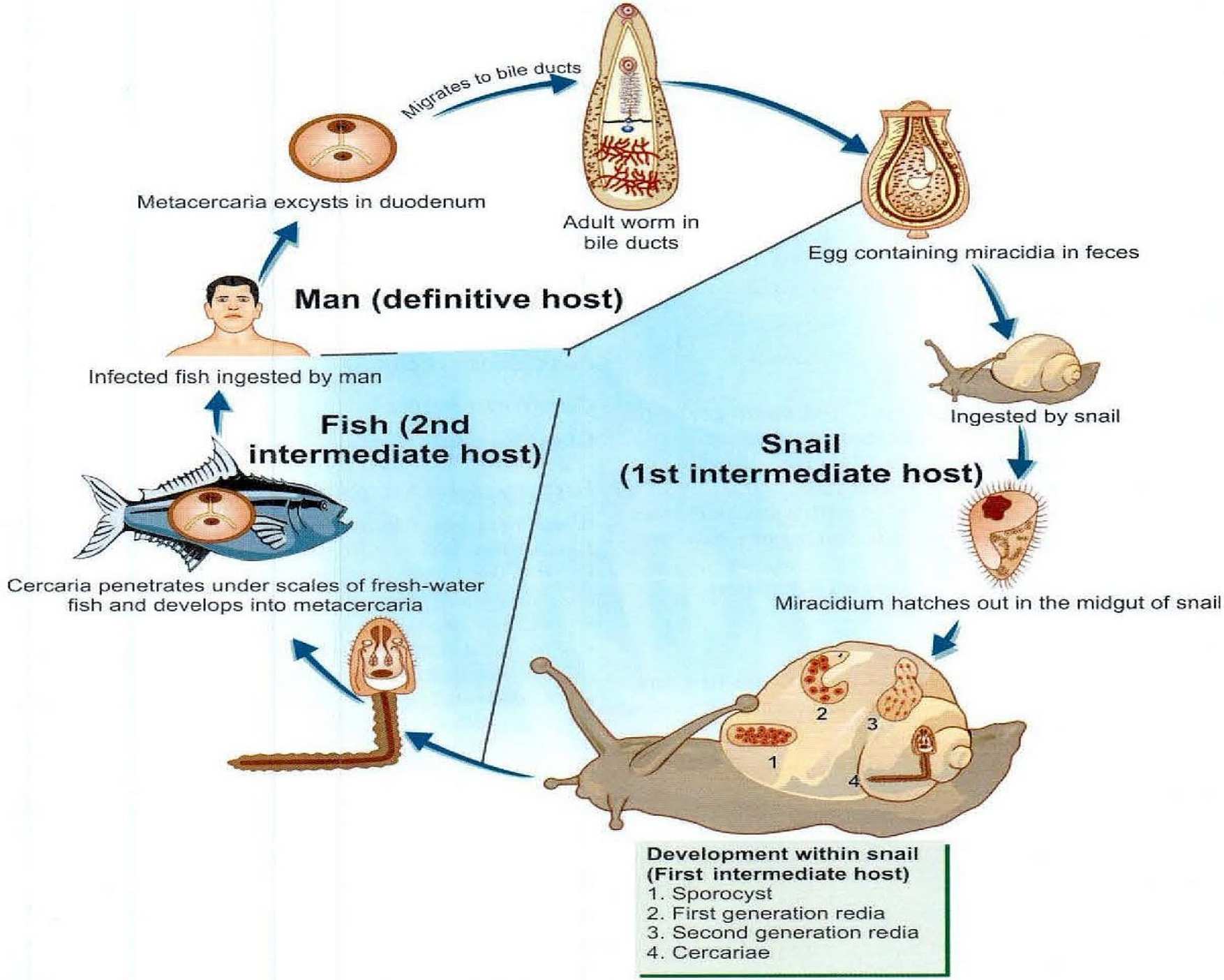
Rediae 2c

Cercariae 2d

1 Embryonated eggs passed in feces.

5 Excyst in duodenum

6 Adults in biliary duct of definitive host.

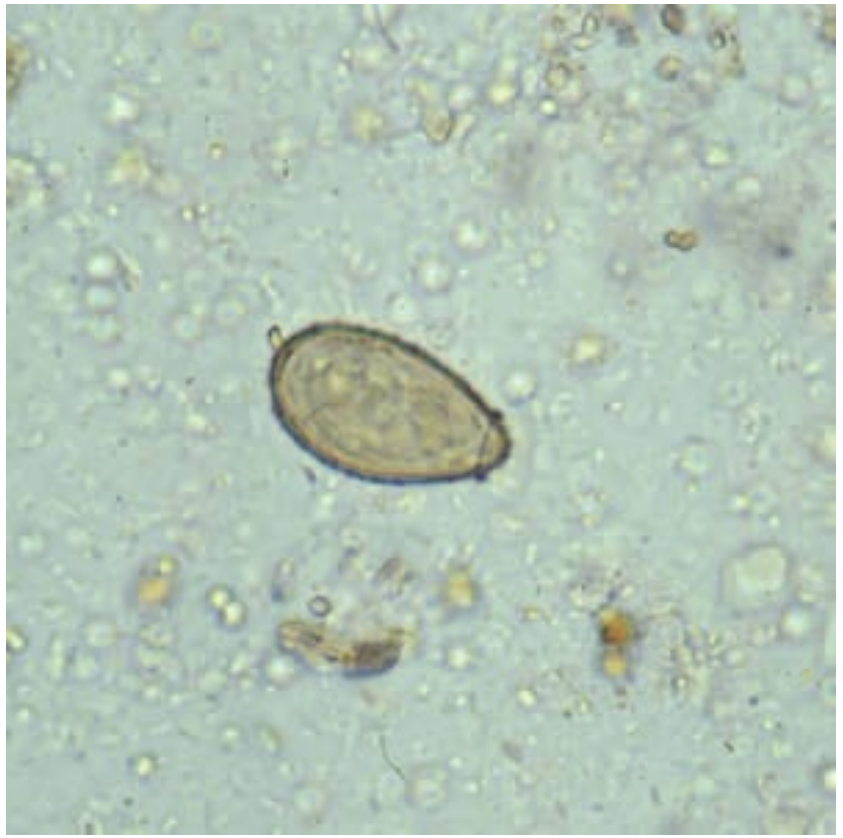

Migrates to bile ducts
Metacercaria excysts in duodenum
Adult worm in bile ducts
Egg containing miracidia in feces
Man (definitive host)
Infected fish ingested by man
Ingested by snail
Fish (2nd intermediate host)
Snail (1st intermediate host)
Cercaria penetrates under scales of fresh-water fish and develops into metacercaria
Miracidium hatches out in the midgut of snail
1
2
3
4
Development within snail (First intermediate host)
1. Sporocyst
2. First generation redia
3. Second generation redia
4. Cercariae

Pathogenicity

- The migration of the larva up the bile duct induces desquamation, followed by hyperplasia, and sometimes, adenomatous changes.
- The adult worms may obstruct and block the common bile duct, leading to cholangitis.
- Patients in the early stage have fever, epigastric pain, diarrhea, and tender hepatomegaly. This is followed by biliary colic, jaundice, and progressive liver enlargement. Many infections are asymptomatic.
- Chronic infection may result in calculus formation.
- A few cases go on to biliary cirrhosis and portal hypertension.
- Some patients with chronic clonorchiasis tend to become biliary carriers of typhoid bacilli.
- Chronic infection has also been linked with cholangiocarcinoma.

Laboratory Diagnosis

The eggs may be demonstrated in feces *(stool microscopy)* or aspirated bile.



Treatment

Drug of choice is praziquantel 25 mg/ kg, three doses in l day. Surgical intervention may become necessary in cases with obstructive jaundice.

Prophylaxis

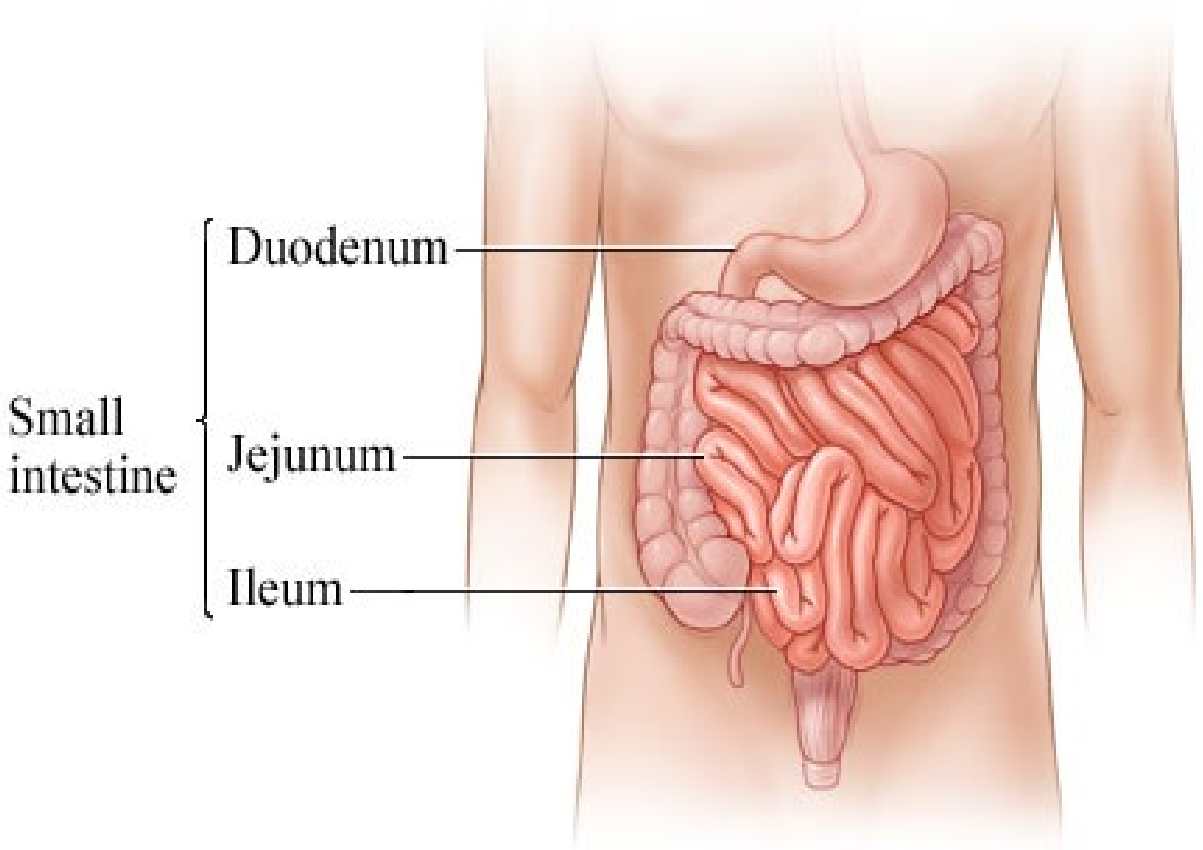
Clonorchiasis can be prevented by:

- Proper cooking of fish.
- Proper disposal of feces.
- Control of snails.

Fasciolopsis buski (Intestinal Fluke)

Habitat

The adult worm lives in the **duodenum** or **jejunum** of pigs and man.

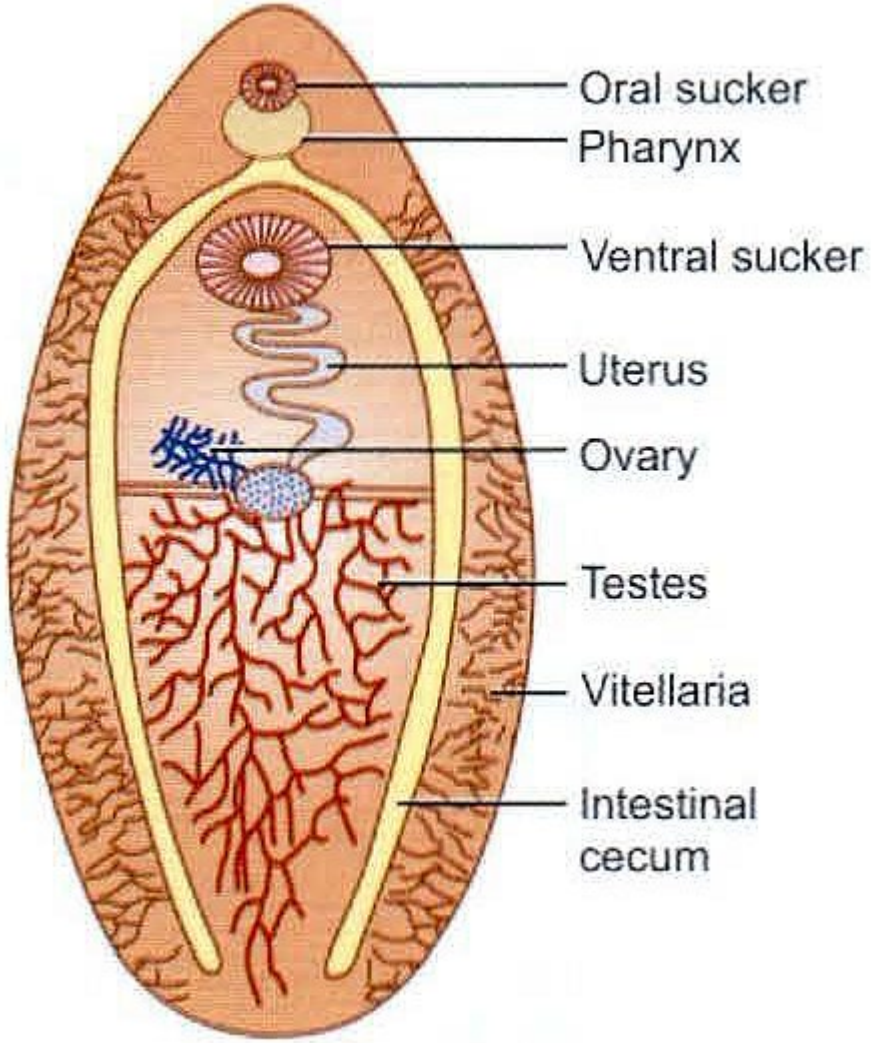


Morphology

Adult worm: The adult is a large, fleshy worm, 20-75 mm long and 8-20 mm broad, and 0.5-3 mm in thickness.

- It is elongated ovoid in shape, with a small oral suckerand a large acetabulum. lt has no cephalic cone as in F. hepatica.
- The adult worm has a lifespan of about 6 months.
- The two intestinal caeca do not bear any branches.

Adult

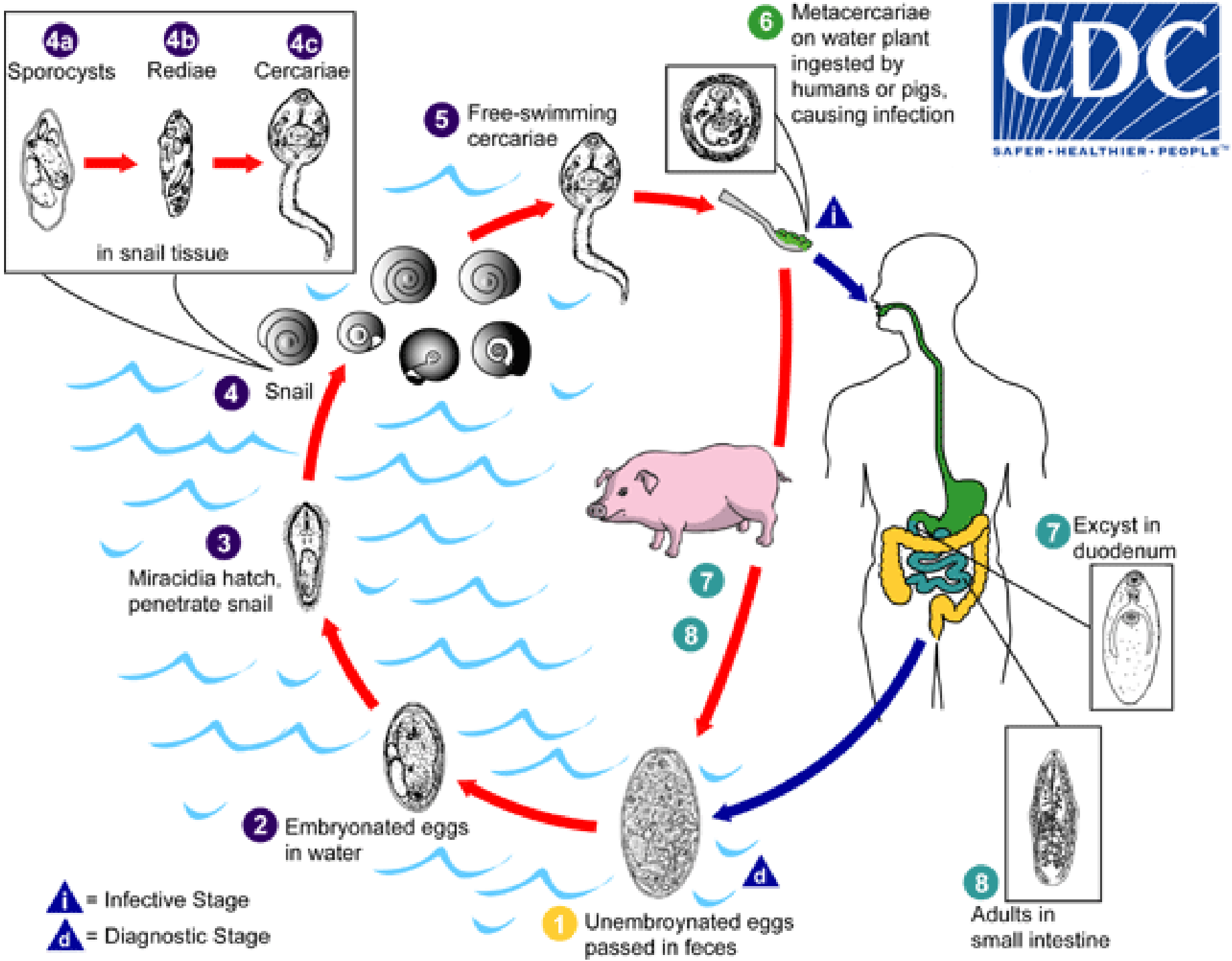

Oral sucker
Pharynx
Ventral sucker
Uterus
Ovary
Testes
Vitellaria
Intestinal cecum

Eggs

- The operculated eggs are similar 10 those of F. hepatica.
- Eggs are laid in the lumen of the intestine in large numbers, about 25,000 per day.

Life cycle

- The cycle begins when unembryonated eggs are passed in the feces of infected humans or pigs into freshwater.
- In water, the eggs hatch and release miracidia, which actively seek and penetrate suitable freshwater snails (the first intermediate host).
- Inside the snail, the parasite undergoes development through sporocyst, redia, and cercaria stages.
- The cercariae emerge from the snail and encyst on the surface of aquatic plants, forming metacercariae, which are the infective stage.
- When humans or pigs consume raw or undercooked aquatic plants carrying metacercariae, infection occurs.
- The ingested metacercariae excyst in the duodenum and attach to the intestinal wall, where they mature into adult worms that produce eggs, continuing the cycle.


4a Sporocysts
4b Rediae
4c Cercariae
in snail tissue
5 Free-swimming cercariae
6 Metacercariae on water plant ingested by humans or pigs, causing infection
CDC
SAFER · HEALTHIER · PEOPLE™
i
4 Snail
3 Miracidia hatch, penetrate snail
7
8
7 Excyst in duodenum
2 Embryonated eggs in water
d
1 Unembroynated eggs passed in feces
8 Adults in small intestine
i = Infective Stage
d = Diagnostic Stage

Pathogenesis

The pathogenesis of fasciolopsiasis is due to traumatic, mechanical, and toxic effects.

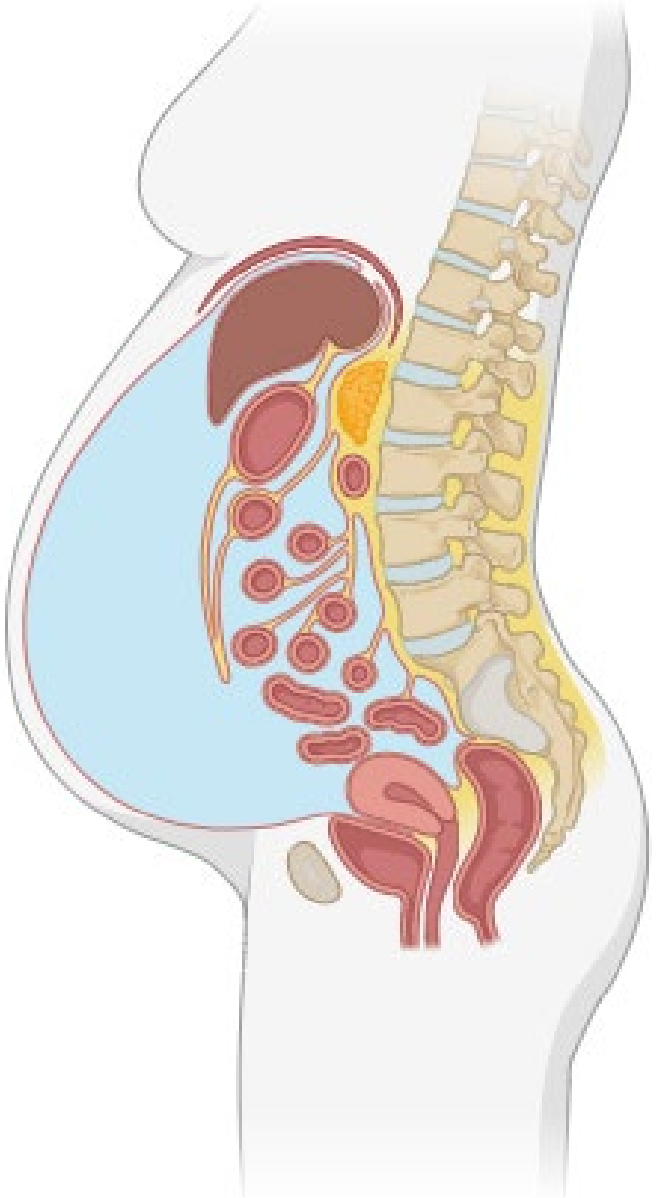
Larvae that attach to the duodenal and jejunal Mucosa cause inflammation and local ulceration. Intoxication and sensitization also account for clinical illness.

In heavy infections, the adult worms cause partial obstruction of the bowel, malabsorption, protein-losing enteropathy, and impaired vitamin B12 absorption.

The initial symptoms are diarrhea and abdominal pain.

Toxic and allergic symptoms usually appear as edema, ascites, anemia, and persistent diarrhea.

Ascitis



Laboratory Diagnosis

History of residence in endemic areas suggests the diagnosis, which is confirmed by the demonstration of the egg in feces or of the worms after administration of a purgative or anthelmintic drug.

Treatment

Drug of choice is **praziquantel.**

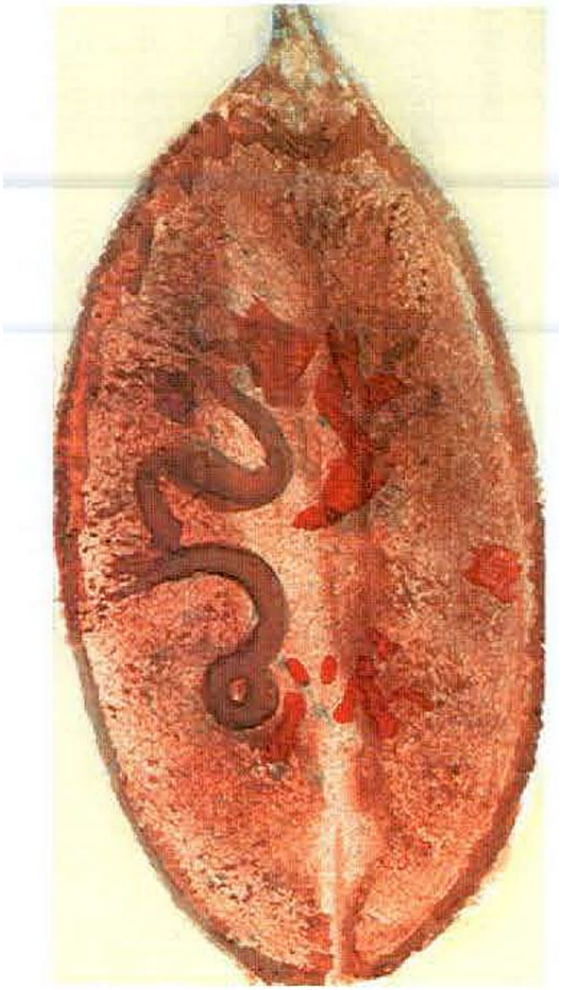
Paragonimus Westermani

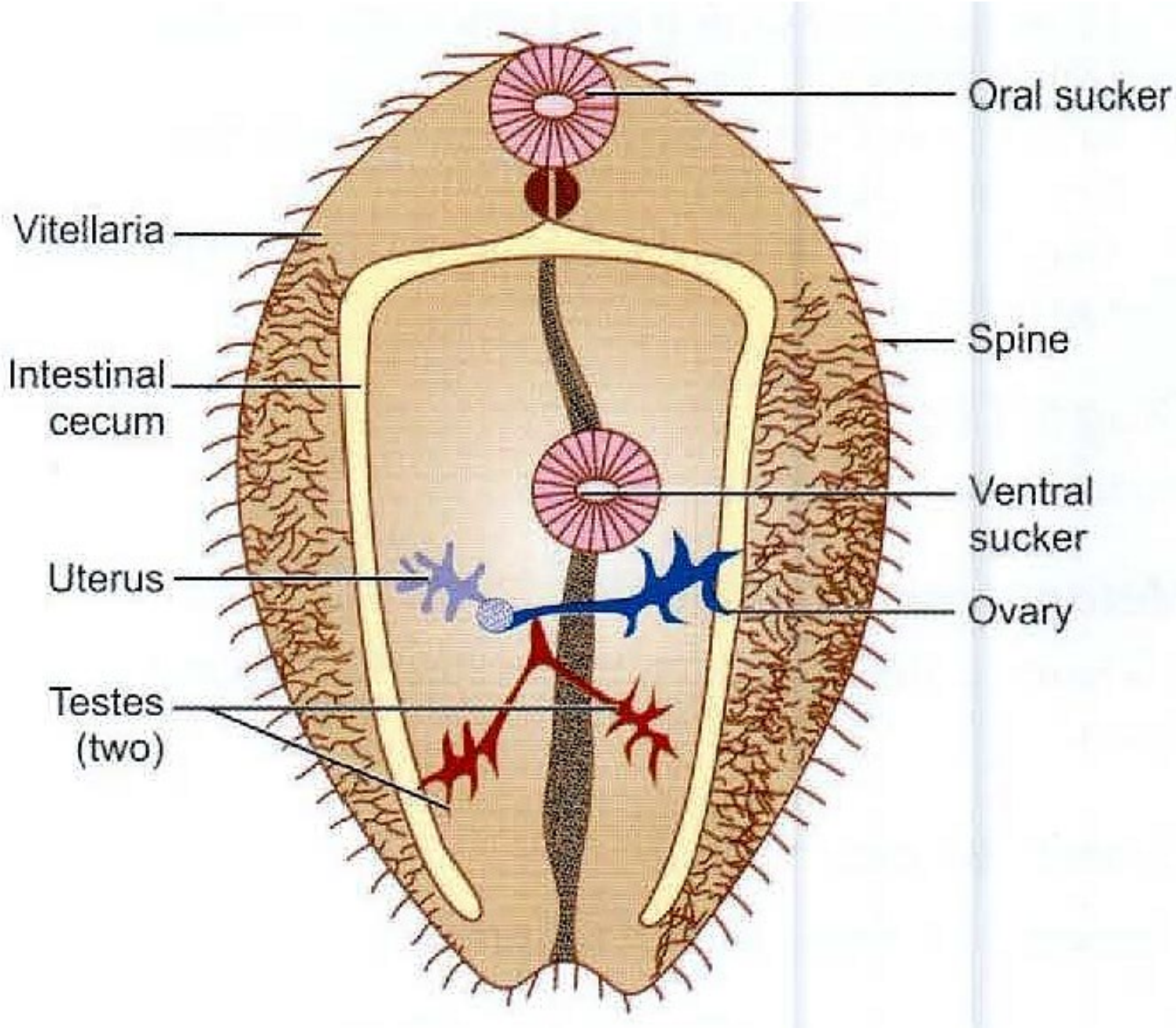
Distribution

The parasite is endemic in the Far East-Japan, Korea, Taiwan, China and South East Asia- Sri Lanka and India.

Morphology

- Adult worm: The adult worm is egg-shaped, about 10 mm long, 5 mm broad and 4 mm thick and reddish-brown in color.
- The integument is covered with scale-like spines. has an oral sucker placed anteriorly and a ventral sucker located towards the middle of the body.
- It has two unbranched intestinal caeca, which end blindly in the caudal area.
- They have a lifespan of up to 20 years in humans.




Oral sucker
Vitellaria
Spine
Intestinal cecum
Ventral sucker
Uterus
Ovary
Testes (two)

Egg:

The eggs are operculated, golden-brown in color and about 100µm by 50µm in size.

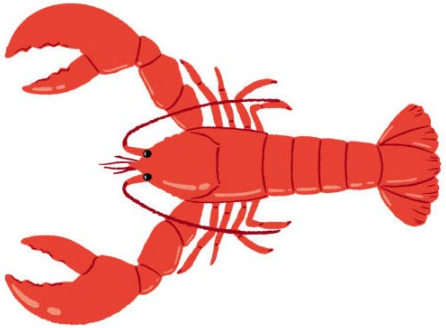
- They are unembryonated when freshly laid.

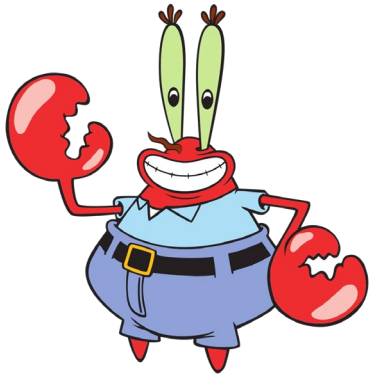
Life Cycle

Definitive host: Man. Besides humans, crab-eating mammals.

First intermediate host: Freshwater snail, belonging to the genera *Semisulcospira* and *Brotia*.

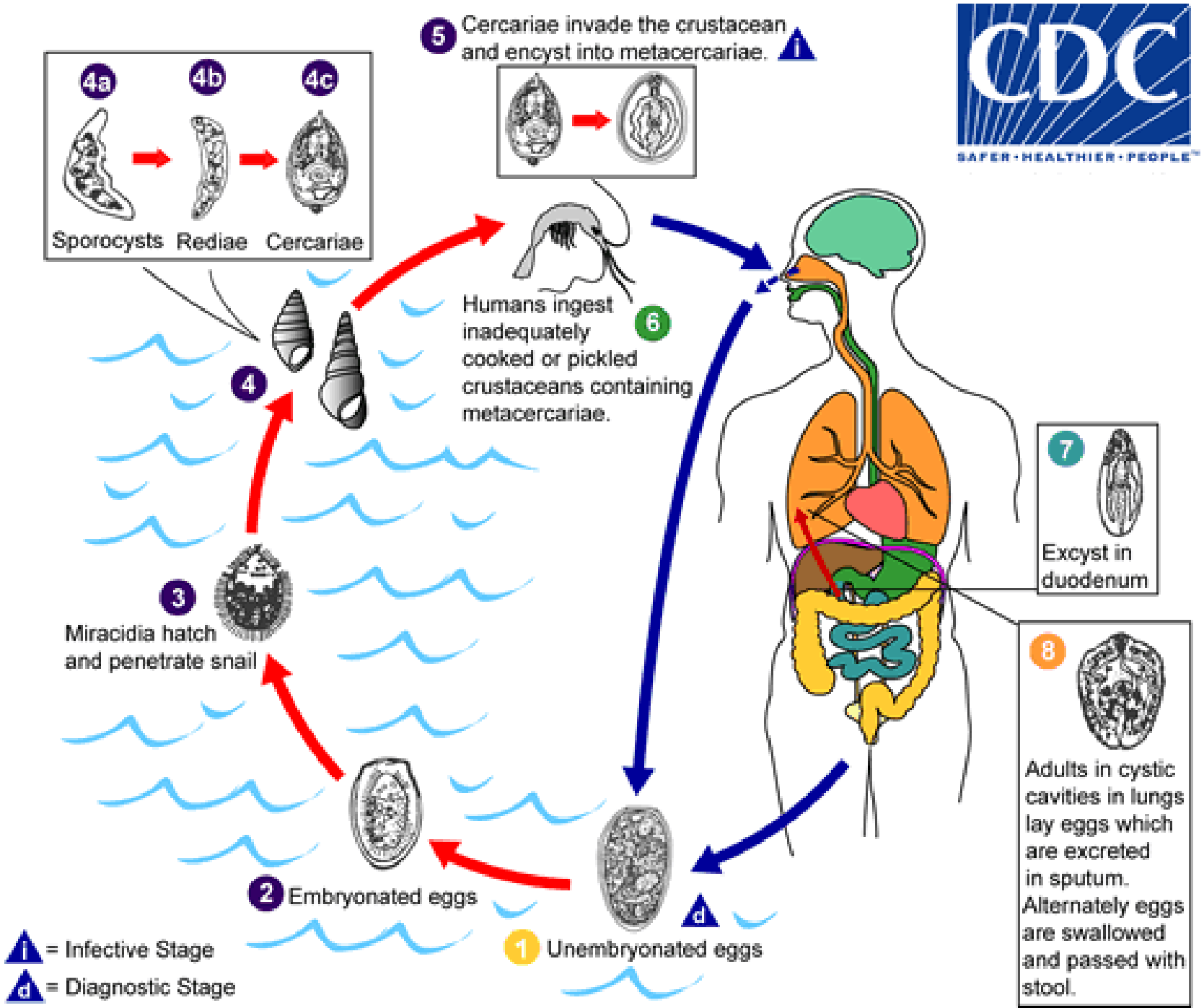
Second intermediate host: Freshwater crab or crayfish.

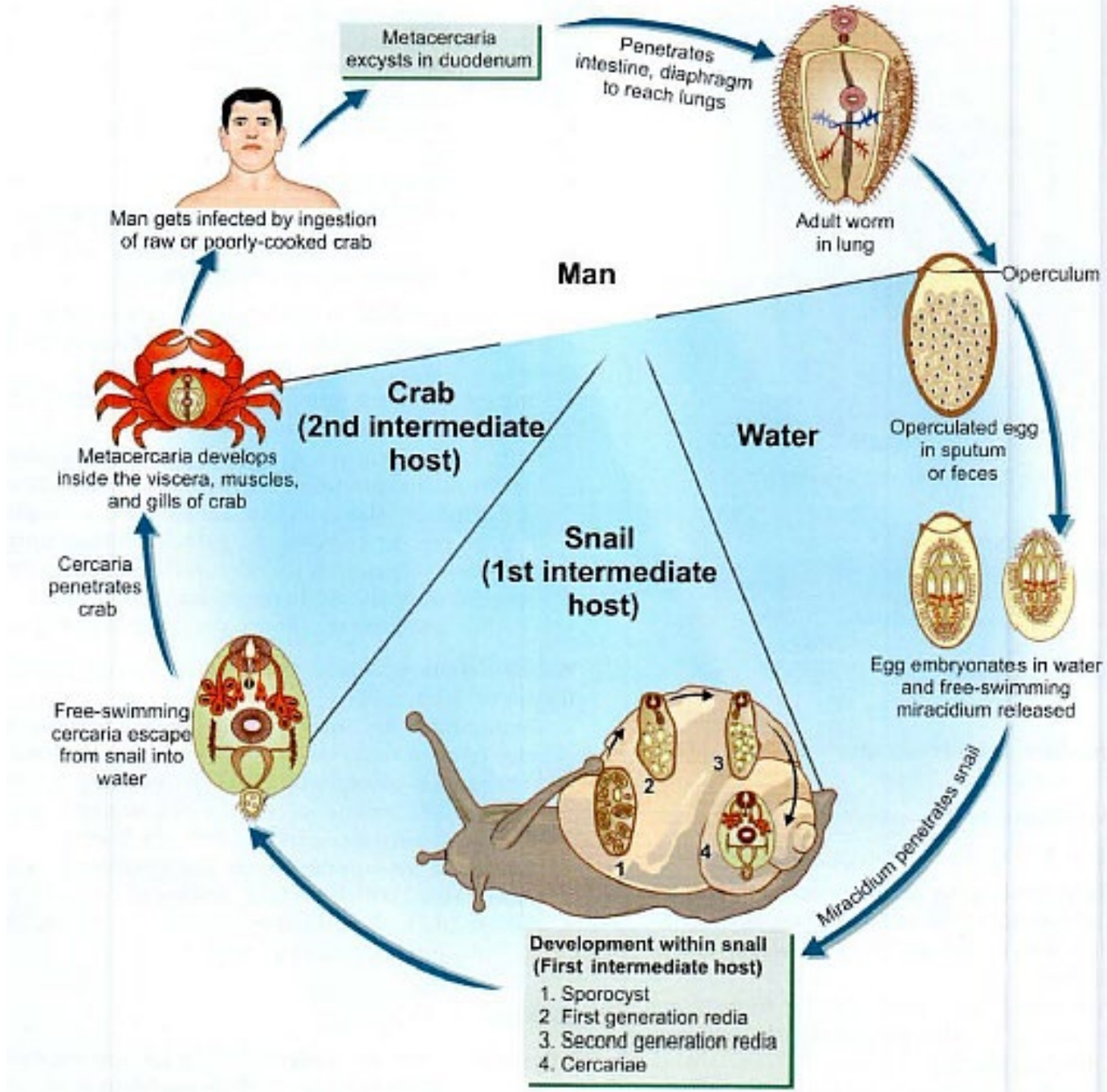




Life cycle

- Eggs are passed in human sputum (or swallowed and passed in feces) into freshwater.
- Miracidia hatch from eggs and infect freshwater snails (first intermediate host), developing into sporocysts → rediae → cercariae.
- Cercariae leave the snail and encyst as metacercariae in crabs or crayfish (second intermediate host).
- Humans become infected by eating raw or undercooked crabs/crayfish containing metacercariae.
- Metacercariae excyst in the duodenum, penetrate the intestinal wall, migrate through the peritoneum, diaphragm, and pleural cavity to reach the lungs, where they mature into adult flukes.


5 Cercariae invade the crustacean and encyst into metacercariae. i
4a
4b
4c
Sporocysts
Rediae
Cercariae
Humans ingest inadequately cooked or pickled crustaceans containing metacercariae.
6
4
3
Miracidia hatch and penetrate snail
2 Embryonated eggs
1 Unembryonated eggs
d
7
Excyst in duodenum
8
Adults in cystic cavities in lungs lay eggs which are excreted in sputum. Alternately eggs are swallowed and passed with stool.
i = Infective Stage
d = Diagnostic Stage


Metacercaria excysts in duodenum
Penetrates intestine, diaphragm to reach lungs
Man gets infected by ingestion of raw or poorly-cooked crab
Adult worm in lung
Man
Operculum
Crab (2nd intermediate host)
Water
Metacercaria develops inside the viscera, muscles, and gills of crab
Operculated egg in sputum or feces
Snail (1st intermediate host)
Cercaria penetrates crab
Egg embryonates in water and free-swimming miracidium released
Free-swimming cercaria escape from snail into water
Miracidium penetrates snail
1
2
3
4
Development within snail (First intermediate host)
1. Sporocyst
2 First generation redia
3. Second generation redia
4. Cercariae

Pathogenicity and Clinical Features

Pulmonary

Adult worms form cysts in the lungs, often communicating with bronchi. Inflammation leads to granulomas, abscesses, pneumonitis, and eosinophilia. Patients may have cough, chest pain, and hemoptysis; sputum contains golden-brown eggs. Chronic cases can mimic tuberculosis.

Pathogenicity and Clinical Features

Extrapulmonary

It is rare in *Paragonimus westermani*.

- **Abdominal:** Migration to the liver or intestinal wall may cause hepatomegaly, tenderness, and bloody diarrhea.
- **Cerebral:** Cysts in the brain or spinal cord cause headache, fever, paralysis, visual disturbances, and seizures.

Laboratory Diagnosis

Microscopy: Demonstration of the eggs in sputum or feces provides definitive evidence. Sputum examination should be repeated for 7 consecutive days.

Serology: *ELISA*, antigen or antibody

Imaging: Chest X-ray reveals abnormal shadows (nodular, cystic, ring infiltrative) in the middle and lower lung field.

Treatment

Praziquantel (25 mg/ kg TDS for 1-2 days) is the drug of choice.