Medical Analysis Department

Liver Flukes

Medical Parasitology Ⅱ (MA302)

Summer School

Lecture 5

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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)

Fasciola hepatica

Case study

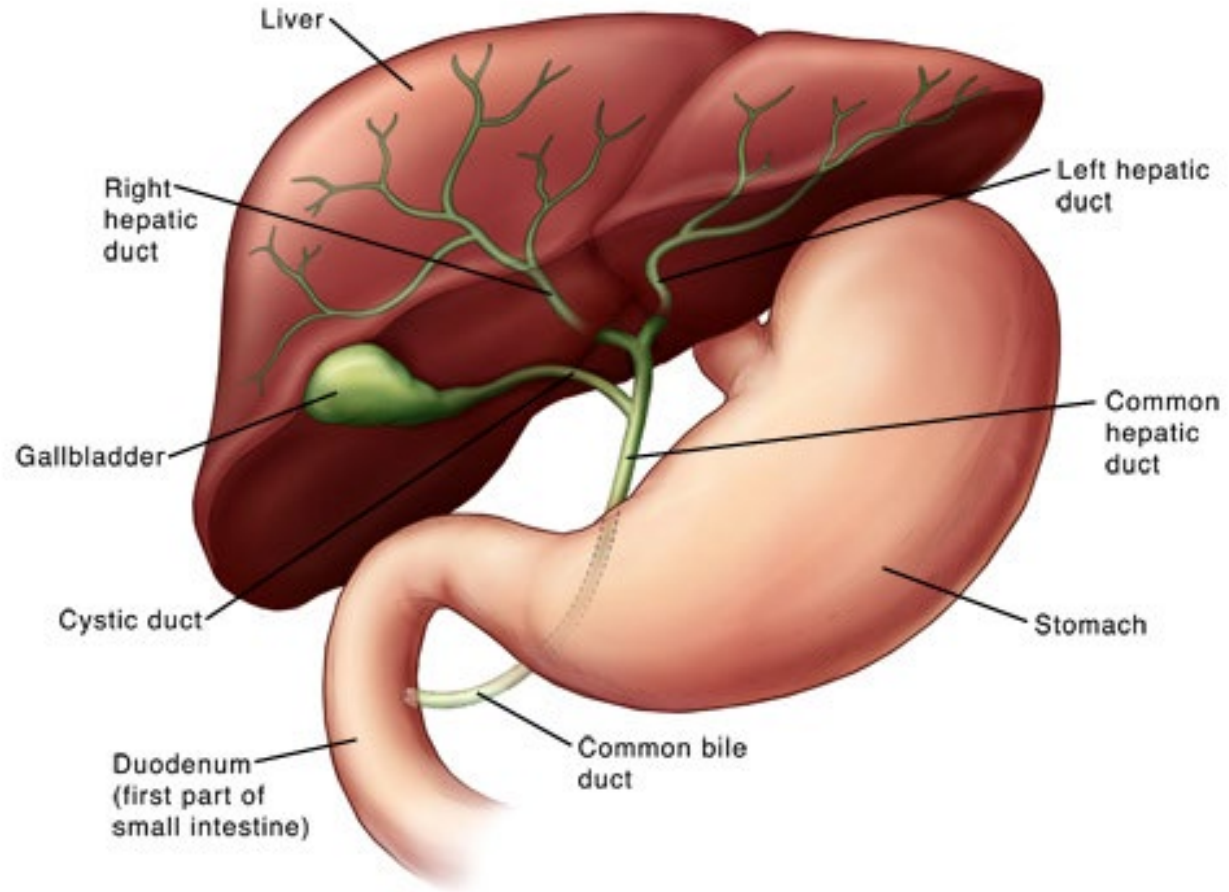
A 42-year-old woman presented with fever, right upper abdominal pain, and enlarged liver after consuming raw watercress from a rural area. Blood examination showed eosinophilia, and stool microscopy demonstrated large operculated eggs of Fasciola hepatica. She was treated with triclabendazole and advised to avoid eating raw aquatic plants, resulting in complete recovery.

Geographical distribution

- It is the largest and most common liver fluke found in man, however its primary host is the sheep and to a less extent, cattle.
- It causes the economically important disease, "liver rot’; in sheep.
- It is worldwide in distribution, being found mainly in sheep-rearing areas.

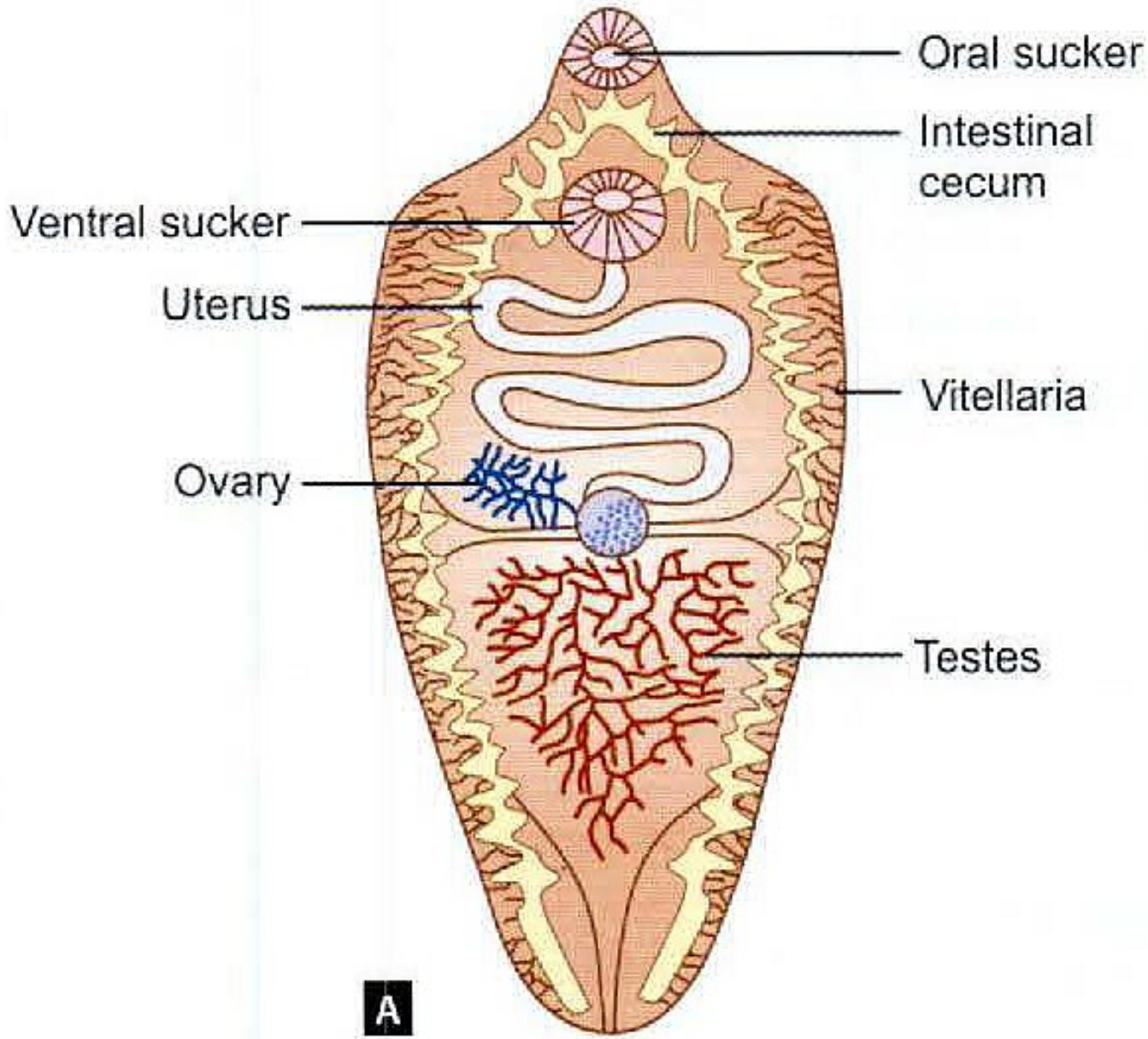
Habitat

Adult worm lives in the bile duct of the definitive host



Morphology

1. Shape: broad and leaf-like with head lobe.
2. Size: 2-3cm in length by 0.8-1.3 in breadth.
3. Oral and ventral sucker: oral sucker is smaller than ventral sucker
4. They are hermaphrodite.
5. Female reproductive system consist of single multilobed ovary, a short oviduct leads from the ovary to ootype, two vitteline gland, and coiled tube uterus.
6. Male reproductive system consist of two testes, vas efferent, vas deferens.
7. The intestinal tract has well developed pharynx, short esophagus and two branched intestinal caeca which are extending from the anterior end to the posterior end of the body.


Oral sucker
Intestinal cecum
Ventral sucker
Uterus
Vitellaria
Ovary
Testes
A

Morphology

Egg:

The eggs are large, ovoid, operculated, bile-stained and about 140 µm by 80 µmi n size

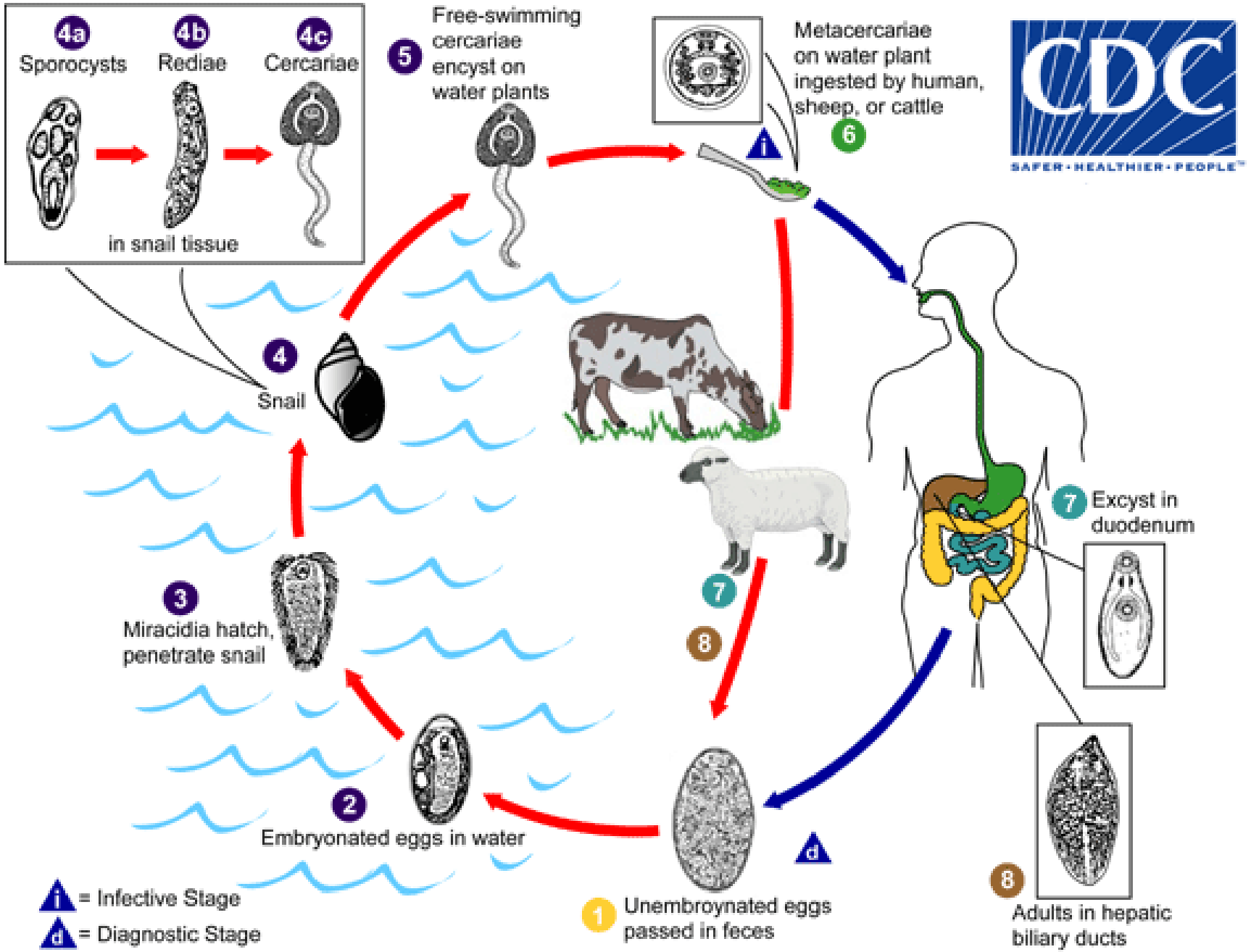
Hosts

- Intermediate host: freshwater snail (*Lymnaea* sp.)

- Definitive host: sheep, cattle, goat and human

Life Cycle

- Eggs are passed in feces of infected herbivores or humans.In water, eggs hatch and release miracidia.
- Miracidia infect Lymnaea snails (intermediate host).
- Inside the snail they develop into sporocyst, redia, and cercariae.
- Cercariae leave the snail and encyst on aquatic plants as metacercariae (infective stage).
- Humans or animals become infected by eating contaminated water plants such as watercress.
- Metacercariae excyst in the duodenum, penetrate the intestinal wall, migrate through the peritoneum, and reach the liver.
- Adult flukes live in bile ducts and produce eggs, completing the cycle.


4a
Sporocysts
4b
Rediae
4c
Cercariae
in snail tissue
5
Free-swimming cercariae encyst on water plants
Metacercariae on water plant ingested by human, sheep, or cattle
6
i
CDC
SAFER · HEALTHIER · PEOPLE™
4
Snail
3
Miracidia hatch, penetrate snail
7
Excyst in duodenum
8
2
Embryonated eggs in water
d
1
Unembroynated eggs passed in feces
8
Adults in hepatic biliary ducts
i = Infective Stage
d = Diagnostic Stage

Pathogenesis

F. hepatica is larger, causing greater mechanical and parenchymal liver damage. Since humans are not its primary host, it produces a stronger inflammatory response, and in some cases larvae may migrate through the liver and diaphragm into the lungs.

Acute phase

In the acute phase during the migration of the larva, patients present with fever, right upper quadrant pain, eosinophilia, and tender hepatomegaly.

Pathogenesis

Chronic Phase

In the chronic phase, fascioliasis may cause biliary obstruction, cirrhosis, jaundice, gallstones, and anemia, but it is not linked to liver cancer.

Eating raw infected sheep liver can cause halzoun, where worms attach to the throat mucosa, leading to congestion, dysphagia, dyspnea, and rarely asphyxia. This condition, also seen with pentastome larvae, is common in Lebanon and parts of the Middle East and North Africa.

Diagnosis

- **Stool microscopy:** Demonstration of eggs in feces or aspirated bile from duodenum is the best method of diagnosis. Eggs of E hepatica and F. buski are indistinguishable
- **Serodiagnosis**: Serological tests such as ELISA, is helpful in lightly infected individuals for detection of specific antibodies. ELISA becomes positive within 2 weeks of infection and is negative after treatment. In chronic fascioliasis, Fasciola antigen may be detected in stool.

Treatment

Oral triclabendazole (10 mg/kg once) is the treatment of choice.

Alternative drug is **bithionol** (30-50 mg for 10- 15 days).
Prednisolone at a dose of 10-20 mg/ kg is used to control toxemia.

Prevention

Fascioliasis can be prevented by:

- Health education.
- Control of snails.
- Proper disposal of human, sheep, and cattle feces.
- Proper disinfection of watercresses and other water vegetations before consumption.

Clonorchis Sinensis

Case study

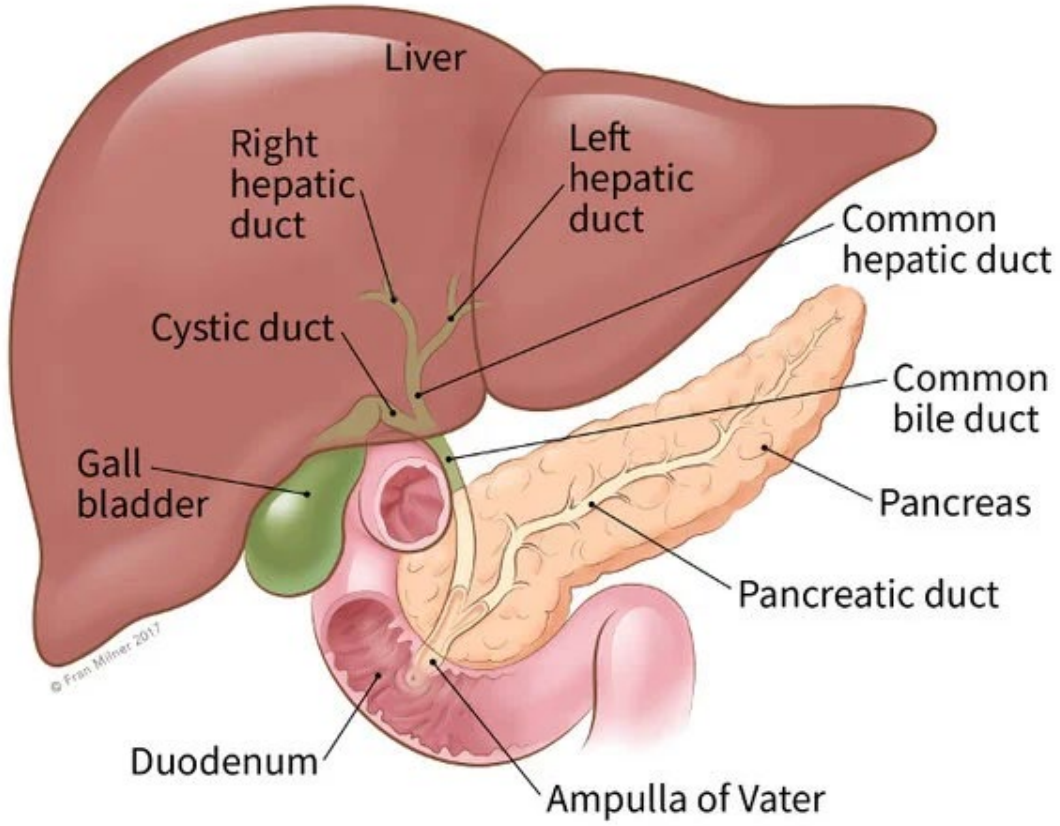
A 45-year-old man complained of recurrent right upper abdominal pain and indigestion after regularly eating raw freshwater fish. Stool microscopy revealed small operculated eggs of **Clonorchis sinensis**. He was treated with praziquantel and advised to avoid consuming raw freshwater fish, resulting in complete recovery.

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

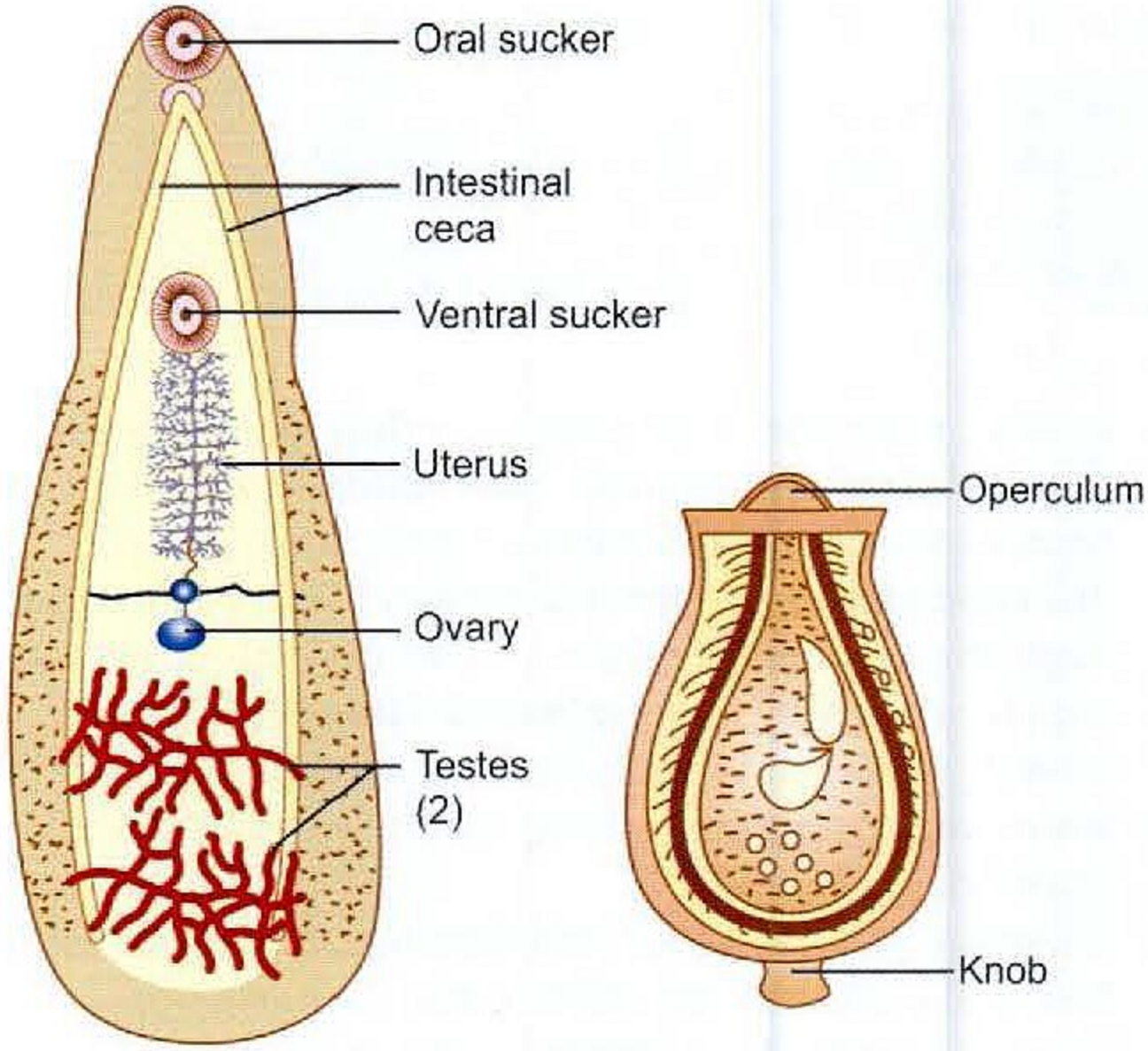
Adult worm: It has a flat, transparent, spatulate body; pointed anteriorly and rounded posteriorly.

- 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.

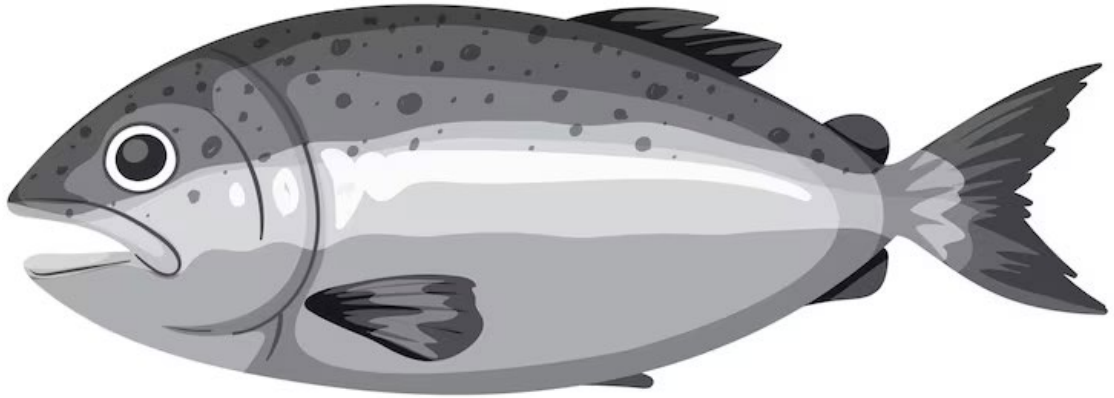
- It is operculated at one pole and possesses a tiny knob at the other pole and a small hook-like spine at the other
- The eggs passed in feces contain the ciliated miracidia.


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

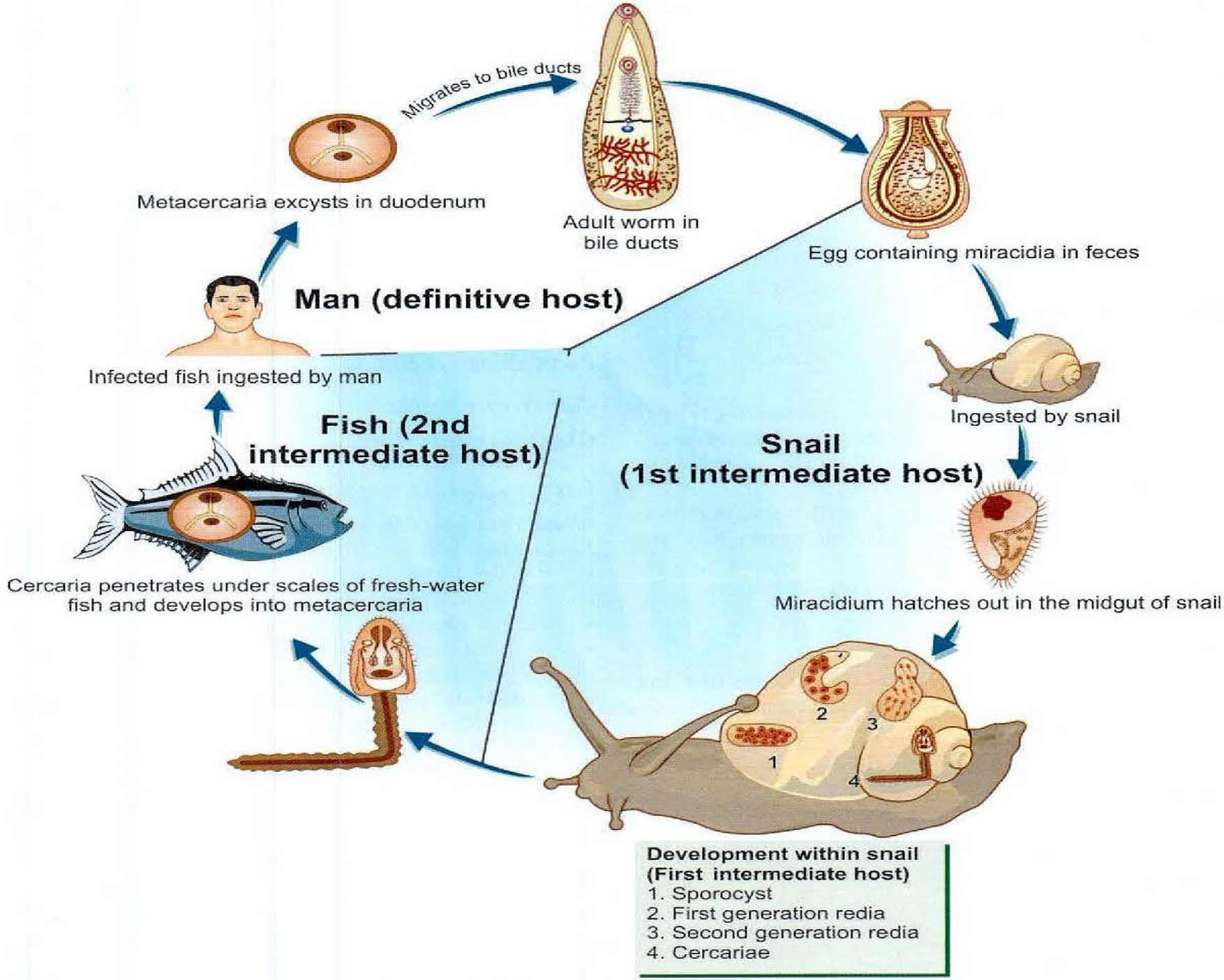
Rediae 2c

Cercariae 2d

1 Embryonated eggs passed in feces.

5 Excyst in duodenum

6 Adults in biliary duct of definitive host.

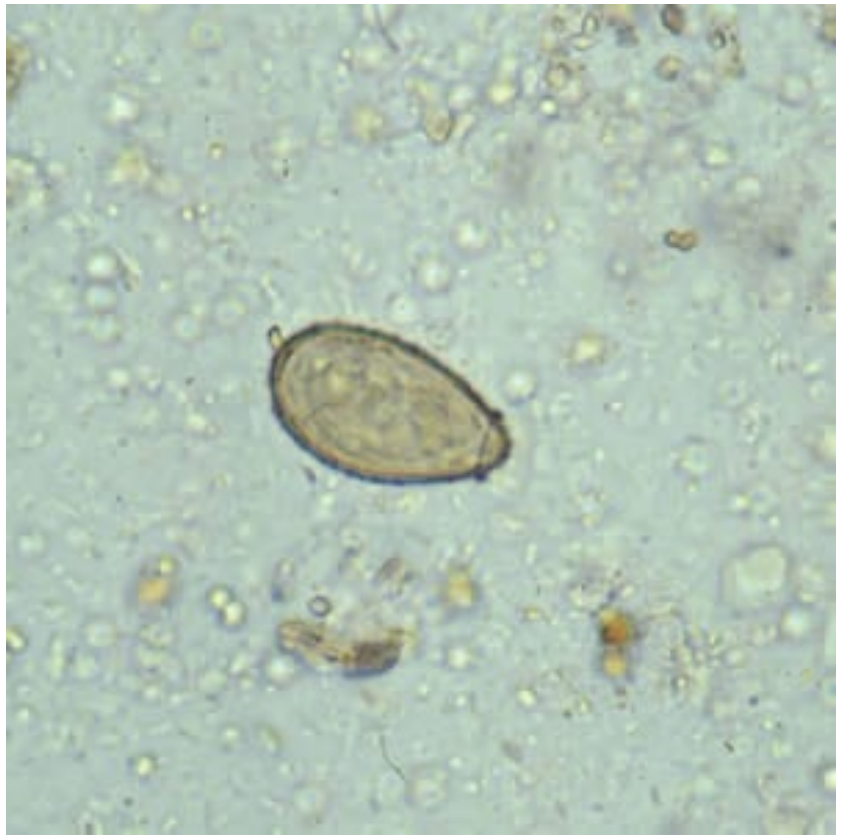

Migrates to bile ducts
Metacercaria excysts in duodenum
Adult worm in bile ducts
Egg containing miracidia in feces
Man (definitive host)
Infected fish ingested by man
Ingested by snail
Fish (2nd intermediate host)
Snail (1st intermediate host)
Cercaria penetrates under scales of fresh-water fish and 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.

References

- Paniker, C. K. J. & Ghosh, S. 2021. *Paniker's textbook of medical parasitology,* New Delhi, Jaypee Brothers Medical Publishers.