Trematodes lec. 3

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Liver flukes

1. *Fasciola hepatica*
2. *Clonorchis sinensis*
3. *Opisthorchis viverrini*

The adults of these trematodes live in the biliary ducts and may be also found in the gallbladder in heavy infections.

The, *Clonorchis sinensis* (the Chinese liver fluke) and *Opisthorchis viverrini* (the Southeast Asian liver fluke), are elongated and narrow and much smaller than *Fasciola* (the sheep liver fluke).

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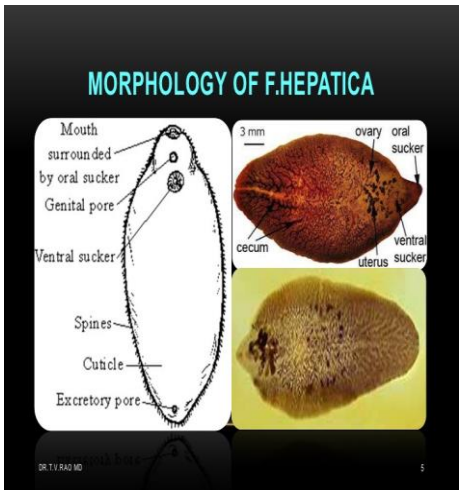
Fasciola hepatica : sheep liver fluke

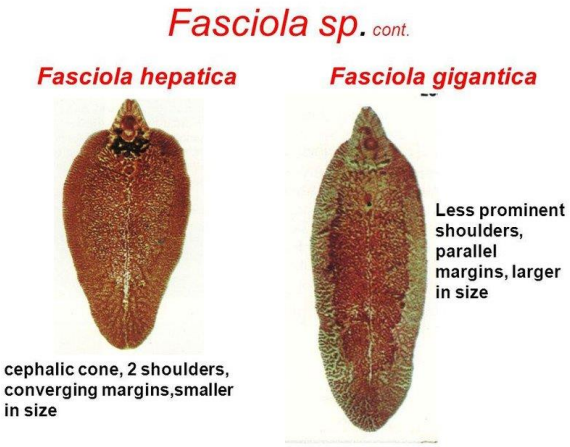
Disease: fascioliasis(in sheep: liver rot.)

Distribution It is worldwide in distribution, being found mainly in sheep-rearing countries.

Morphology

The adult worm: It is one of the largest flukes in the world measuring 30 mm long and15 mm broad ***(Fasciola gigantica***, though, is even bigger and can reach up to 75 mm). Leaf-shaped fleshy fluke, It has a conical projection anteriorly with powerful oral sucker and is rounded posteriorly. The acetabulum is a larger sucker than the oral sucker and is located at the anterior .It is a hermaphrodite. *F. hepatica* is equipped with so-called shoulders





Egg: large, ovoid, operculated, bile stained, measuring 140 µm by 80 µm in size. When passed out it is unembroynated

Life cycle

Habitat The parasite resides in the liver and biliary passages of the definitive host live up to 10 years in human.

Definitive host: Sheep, goat, cattle and man. Eggs *are* laid in the biliary passages and *are* shed in feces.

1st intermediate host snail: genus Lymnaea.

2nd intermediate host freshwater plants, especially watercress

Infective stage; metacercaria

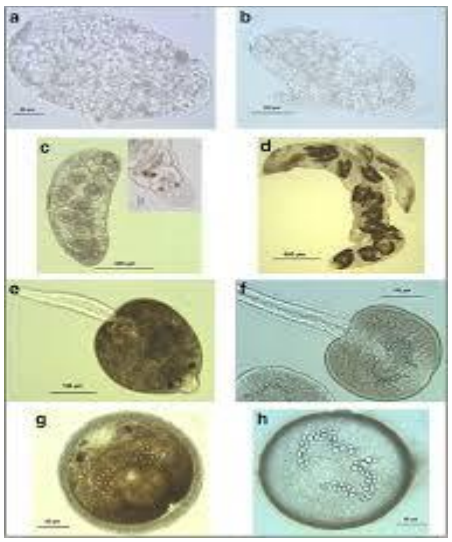
Mode of infection: ingestion of ***metacercariae*** encysted on aquatic vegetation.
F. hepatica passes its life cycle in one definitive host and two intermediate hosts.

The embryo matures in water in about 10 days and the ***miracidium*** escapes. It penetrates the tissues of first intermediate host, snails of the genus *Lymnaea*

In snail, the miracidium progresses through the ***sporocyst*** and the **first and second generation *redia*** stages to become the cercariae in about 1-2 months.
• The **cercariae** escape into the water and encyst on aquatic vegetation or blades of grass to become metacercariae, which can survive for long periods**.**

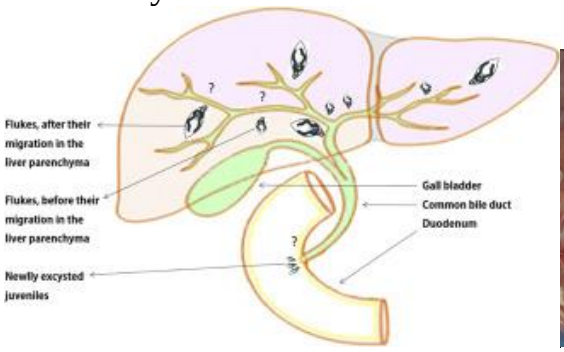
Cercaria

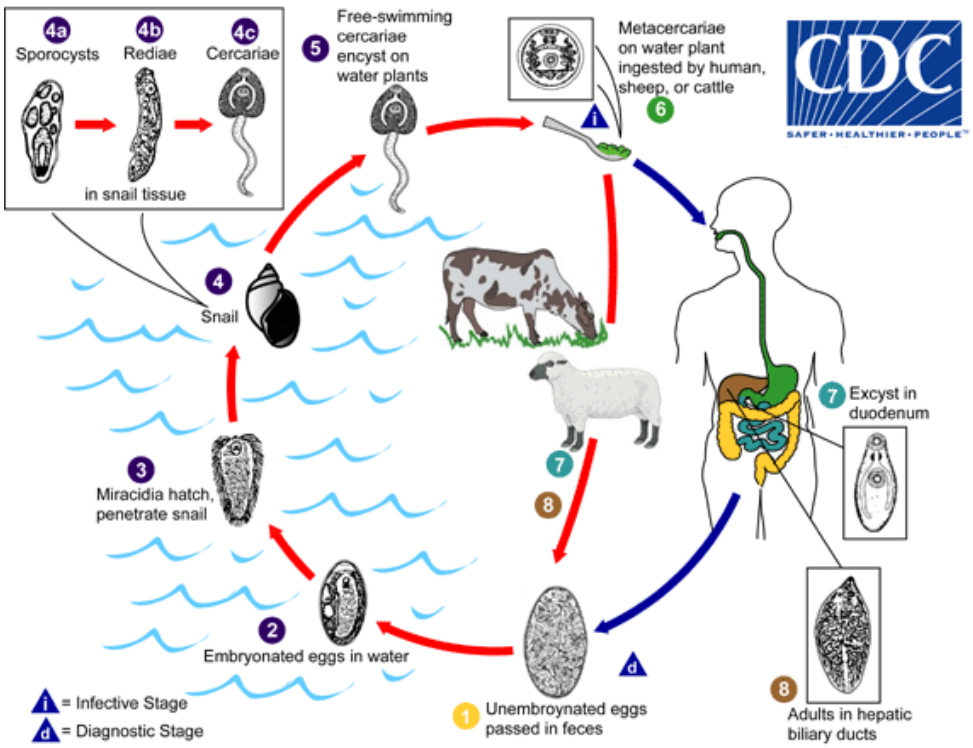
Metacercaria



• Sheep, cattle, or humans eating watercress or other water vegetation containing the metacercaria become infected.

The metacercariae excyst in the duodenum of the definitive host and pierce the gut wall to enter the peritoneal cavity.
They penetrate to liver, reach the biliary passages and liver paranchyma , where they mature into the adult worms in about 3-4 months.





Pathogenesis and Clinical Features

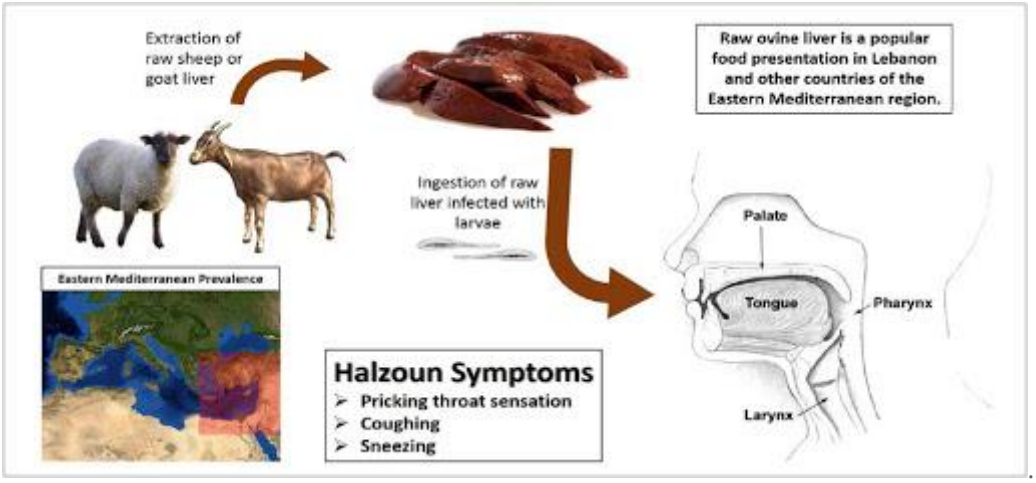
F. hepatica is large causes more mechanical damage and parenchymal injury.

As humans are not its primary host, it causes more severe inflammatory response. Some larvae penetrate right through the liver and diaphragm ending up in the lung.

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

In chronic phase, patients may develop biliary obstruction, biliary cirrhosis, obstructive jaundice, cholelithiasis and anemia. No association to hepatic malignancy has been ascribed to *fascioliasis.*

Occasionally, ingestion of raw liver of infected sheep results in a condition called ***halzoun.*** The adult worms in the liver attach to the pharyngeal mucosa, causing ***edematous congestion*** of the pharynx and surrounding areas, leading to dyspnea, acute dysphagia, deafness and rarely, asphyxiation. Halzoun is particularly common in Lebanon and other parts of the Middle East and North Africa



False fascioliasis???

ID eggs in fecal sample

- unembryonated with distinct

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- size:

(Note: A false ID can occur in a person who has eaten an infected cow or sheep liver. Eggs will be passed through the digestive tract.)

Laboratory diagnosis

1. Stool examination for the egg. Using a sedimentation method and a wet mount with or without iodine staining. More than one specimen may need to be examined to find the parasite. Sometimes eggs are found by examining **duodenal contents or bile.** Infected people don't start passing eggs until they have been infected for several months; people don't pass eggs during the acute phase of the infection.
2. Serology

Enzyme immunoassay (EIA) and ELISA to detected serum IgG antibody cross reactivity with other trematodes, such as the schistosomes, may be an issue.

The role of serology is important in

A. the acute phase of infection, before the onset of egg production;

B. the chronic phase, in cases with low-level or sporadic production of eggs
C. In cases of ectopic infection, in which eggs are not found in stool

Treatment

The drug of choice for the treatment of *Fasciola* spp. is triclabendazole (praziquantel is not effective). It is given in single oral dose of 10 mg/kg. Bithionol is an alternative drug.

Prevention and Control

1. Prevent pollution of water courses with sheep and cattle faeces
2. Proper sanitation
3. Wash watercresses and other water vegetations, preferably in hot water or cook well before consumption.

Clonorchis sinensis (the Chinese liver fluke),

Opisthorchis viverrini (the SoutheastAsian liver fluke)

Clonorchis sinensis Disease clonorchiasis

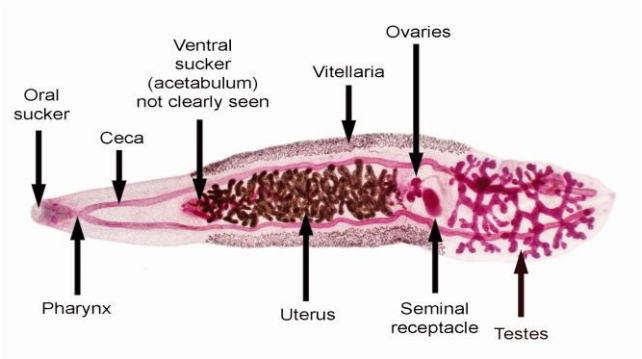
Opisthorchis viverrini Disease opisthorchiasis

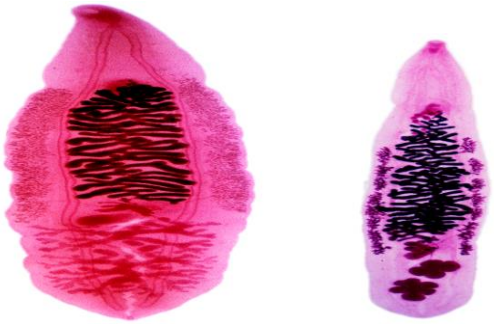
distribution occurs in Japan, Korea, Taiwan, China and Vietnam. *Opisthorchis viverrini* is common in Thailand

Morphology (both worms have almost the same feature)

The adult worm has a flat, transparent, spatulate body; pointed anteriorly and rounded posteriorly .It is 10–25 mm long and 3–5 mm broad. Each end of the adult worm is narrower than the mid portion of the body. The adult worm can survive many years in the biliary tract. The worm is hermaphrodite and passes eggs into the bile duct. The testis of the adult

worm are branched in ***Clonorchis sinensis*** and lobe shape in ***Opisthorchis viverrini***.





Morphology of eggs: are broadly ovoid, 30 µm by 15 µm with a yellowish brown (bile-stained) shell. It is jug shaped and operculated with characteristic shoulders at the terminal end of the egg, a small knob is sometimes visible. A thick rim is located around the operculum and is referred to as shoulders. The eggs passed in faeces contain ciliated miracidia .

Life cycle

Habitat

Adult worm lives in the biliary tract.

Definitive host: human and carnivorous animals

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

Intermediate hosts: Two intermediate hosts

1st intermediate host : snail *genus Bulimus*

2nd intermediate host: fresh water fish

Infective form: Metacercaria larva.

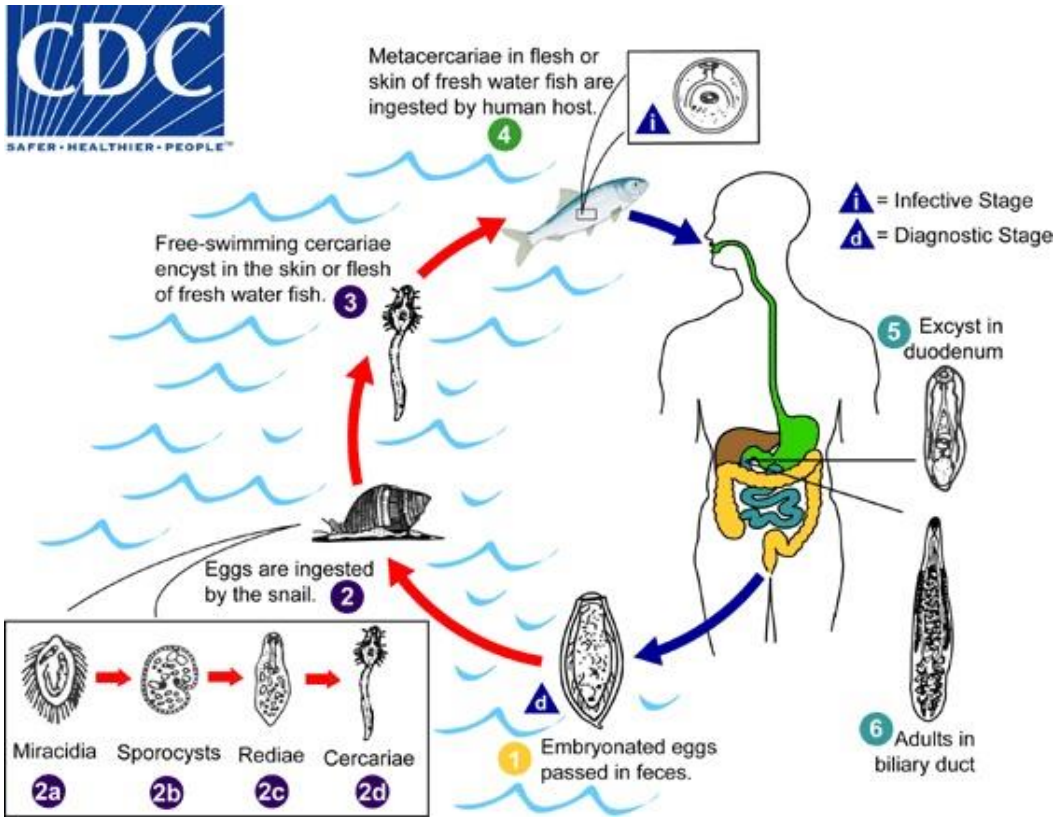
Mode of infection: Man acquires infection by eating undercooked freshwater fish carrying metacercariae larvae.

Clonorchis eggs although embryonated do not hatch in water, but only when ingested by suitable species of ***snails*** .The miracidium develops through the ***sporocyst*** and ***redia*** stages to become cercaria .The cercariae escape from the snail and swim about in water, waiting to get attached to the second intermediate host, suitable freshwater fish. The cercariae shed their tails and encyst under the scales or in the flesh of the fish to become metacercariae, which are the *infective stage* for humans.

Infection occurs when such fish are eaten raw or inadequately processed by human or other definitive hosts. The metacercariae excyst in the duodenum of the definitive host travel in the body enter the common bile duct through the *ampulla of Vater* and proceed to the distal bile capillaries, where they mature in about a month and assume the adult form

• Adult worms produce eggs, which exit the bile ducts and are excreted in the feces.

The cycle is then repeated



Pathogenesis and clinical features:

The migration of the larva up the bile duct induces desquamation, followed by hyperplasia and sometimes adenomatous changes. The smaller bile ducts undergo cystic dilatation. The adult worm may cause obstruction and blockage of the common bile duct leading to cholangitis. Chronic infection may result in calculus formation.

1. Light infections with *C. sinensis* or *O. viverrini* are most common and may be asymptomatic.
2. Heavier infections with these flukes may present with fever, abdominal pain, and jaundice. Eosinophilia and increased serum levels of IgE may occur. Severe infections may cause obstruction of the biliary ducts, resulting in enlargement and tenderness of the liver, cirrhosis, cholecystitis and cholangiocarcinoma.

Laboratory diagnosis

1. Identification of the liver flukes is primarily made by recovery of the eggs in feaces using a sedimentation method and a wet mount with or without iodine staining.
2. Serology

   Enzyme immunoassay (EIA) and ELISA to detected serum IgG antibody cross reactivity with other trematodes, such as the schistosomes, may be an issue.

Treatment

The drug of choice for treatment of infections with *Clonorchis* and *Opisthorchis* is praziquantel (25 mg/kg) given orally three times per day for 2 days.

Prevention and Control

Prevention and control measures for halting the spread of *C. sinensis* include practicing proper sanitation procedures, especially in regard to fecal disposal by the human and reservoir host (dogs and cats) and avoiding the ingestion of raw, undercooked, or freshly pickled freshwater fish and shrimp.