Subclass Digenea (Trematoda) – include:

- **Liver**

  *Fasciola hepatica*

  *Clonorchis sinensis*

  **Fascioliasis: Fasciola hepatica & Fasciola gigantica**

  *Fasciola hepatica* commonly called (the sheep liver fluke) parasites of herbivores (particularly sheep and cattle) and humans.

  **Causative agent of fascioliasis hepatica or liver rot**

  **Geographic Distribution:** Fascioliasis occurs worldwide. Human infections with *F. hepatica* are found in areas where sheep and cattle are raised, and where humans consume raw watercress, including Europe, the Middle East, and Asia. Infections with *F. gigantica* have been reported, more rarely, in Asia, Africa, and Hawaii.

  **Habitat:** the adult is parasite of herbivores animals like sheep, goat and cattle. live in the biliary and gallbladder. It is occasionally found in the liver of human

  **Morphology of adult worm**

  - one of the larg flukes of the world, reaching a length of 3 cm and a width of 1.5 cm.
  - It is leaf-shape, pointed posteriorly, and wide anteriorly.
  - The oral sucker is small the acetabulum is larger than the oral sucker and is anterior.
  - The tegument is covered with large, and scale like spines.
  - The intestinal ceca are highly dendritic and extend to near the posterior end of the body.
  - The testes are large and greatly branched, arranged in tandem behind the ovary. Vitelline follicles are extensive, filling most of the lateral body.

  **Characteristics of egg**

  -large in size measuring 130 to 140 um in length by80 to 90 um in width
  -oval in shape
  -operculated and unembryonated.

  *Fasciola gigantica* commonly called Giant liver fluke:

  **Adult Worm**

  - Large may attain a length 7.4 cm
  - More lanceolate
  - Less developed shoulders (shorter cephalic cone)
  - Larger ventral sucker
  - The eggs are large.
  - The life cycle of parasite is very similar to that of *F. hepatica*
Life cycle of *Fasciola* spp

*Fasciola* require three host to complete the life cycle:

a- definitive host: sheep, goat and human

b- primary intermediate host: snail like *Lymnae*

c- secondary intermediate host: plant like water cress.

- Immature eggs are discharged in the biliary ducts and in the stool. Eggs become embryonated in water, eggs release miracidia, which invade a suitable snail intermediate host, including many species of the genus *Lymnae*. In the snail the parasites undergo several developmental stages (sporocysts, rediae, and cercariae). The cercariae are released from the snail and encyst as metacercariae on aquatic vegetation or other surfaces. Mammals acquire the infection by eating vegetation containing metacercariae. Humans can become infected by ingesting metacercariae-containing freshwater plants, especially watercress. After ingestion, the metacercariae excyst in the duodenum and migrate through the intestinal wall, the peritoneal cavity, and the liver parenchyma into the biliary ducts, where they develop into adults. In humans, maturation from metacercariae into adult flukes takes approximately 3 to 4 months. The adult flukes reside in the large biliary ducts of the mammalian host. *Fasciola hepatica* infect various animal species, mostly herbivores.
Life cycle

Laboratory diagnosis

Stool examination reveals large, oval, operculated and unembryonated eggs indistinguishable from the eggs of *F. buski*.

Exact identification is a therapeutic problem because treatment is not the same for both infections. Whereas *F. buski* responds favorably to praziquantel, *F. hepatica* does not.

When exact identification is desired, examination of a sample of the patient's bile differentiates the species; if the eggs are present in bile, they are *F. hepatica*, not *F. buski*, which is limited to the small intestine.

Eggs may appear in stool samples from people who have eaten infected sheep or cattle liver.

The spurious nature of this finding can be confirmed by having the patient refrain from eating liver and then rechecking the stool.

ELISA tests are available commercially and can detect anti-hepatica antibodies in serum and milk, but new ones especially intended for use on fecal samples are being developed.
Clonorchis sinensis or Opisthorchis sinensis

Clonorchis sinensis, also referred to as Clonorchis sinensis, is commonly called the Chinese or oriental liver fluke.

1. This trematode differs from other fluke cycles because the eggs are eaten by the snail, then reproduction begins in the soft tissues of the snail.

2. C. sinensis also requires a second intermediate host, freshwater fish, where the cercariae encyst and develop into infective metacercariae

**Geographic distribution:** is found in China, Japan, Korea, and Vietnam.

**Morphology of adult worm**

- Slender, pointed anterior, rounded posterior
- 1-2.5 cm long and 0.3-0.5 cm wide
- Characteristic branching testes posterior and one ovary round in shape.
- Intestinal ceca are simple and not branched
- It has two suckers. Oral is at the anterior end. The ventral sucker is little smaller. The oral sucker are situated at the junction of the anterior and middle third of the body

**Characteristics of egg**

- Contain fully developed miracidia
- Possess prominent opercular shoulders (flask shaped egg) and are operculate at one end and a small knob at the other end.
- They are bile stained and measure 29μm by 16μm.
Life cycle of *Clonorchis sinensis*

Embryonated eggs are discharged in the biliary ducts and in the stool. Eggs are ingested by a suitable snail intermediate host; there are more than 100 species of snails that can serve as intermediate hosts. Each egg releases a miracidia, which go through several developmental stages (sporocysts, rediae, and cercariae). The cercariae are released from the snail and after a short period of free-swimming time in water, they come in contact and penetrate the flesh of freshwater fish, where they encyst as metacercariae. Infection of humans occurs by ingestion of undercooked, salted, pickled, or smoked freshwater fish. After ingestion, the metacercariae excyst in the duodenum and ascend the biliary tract. Maturation takes approximately 1 month. The adult flukes reside in small and medium sized biliary ducts. In addition to humans, carnivorous animals can serve as reservoir hosts.

Laboratory diagnosis

- The diagnosis is made by recovering the distinctive eggs from stool. In mild infections, repeated examinations of stool

- Duodenal aspirates may be necessary.

- In acute symptomatic infection, there are usually eosinophilia and an elevation of serum alkaline phosphatase and bilirubin levels.

- Radiographic imaging procedures may detect abnormalities of the biliary tract