



## Liver Flukes

### *Fasciola hepatica* & *Fasciola gigantica*

- ❖ *Fasciola hepatica*: also known as (common **liver fluke** or **sheep liver fluke**), is a parasitic flatworm of the Class Trematoda, Phylum Platyhelminthes that infects the livers of various mammals, including humans. The disease caused by the fluke is called **fascioliasis** or **fasciolosis**.
  - ❖ *F. hepatica* is **worldwide distributed**, and causes great economic losses in sheep and cattle. Liver fluke infestation is diagnosed by yellow- brown eggs in the feces.
  - ❖ *Fasciola gigantica* also a parasitic flatworm of the Class Trematoda, which causes tropical fascioliasis. It is distributed in **Asia and Africa**.
- Estimates of infection rates are as high as **80-100%** in some countries.
  - The geographical distribution of *F. gigantica* overlaps with *F. hepatica* in many African and Asian countries and sometimes in the same country, in regions with intensive sheep and cattle production.

### Comparison

Characteristic	<i>Fasciola hepatica</i>	<i>Fasciola buski</i>
Common name	Sheep liver fluke	Large intestinal fluke
Infects	Sheep, cattle, humans	Pigs, dogs, rabbits, humans
Locations of adults	Bile duct	intestine
Eggs	145 µm x 80 µm	145 µm x 80 µm
Adult fluke	2-3 cm long	~7 cm long

### Fasciolosis

- Also known as **Fascioliasis**, **distomatosis** and **liver rot**, is an important helminthes disease caused by two trematodes *F. hepatica* and *F. gigantica*. This disease belongs to **the plant-borne trematode zoonoses**.

- The definitive host range is very broad and includes many herbivorous mammals, including humans.
- The life cycle includes freshwater snails as an intermediate host of the parasite.

## Human fasciolosis

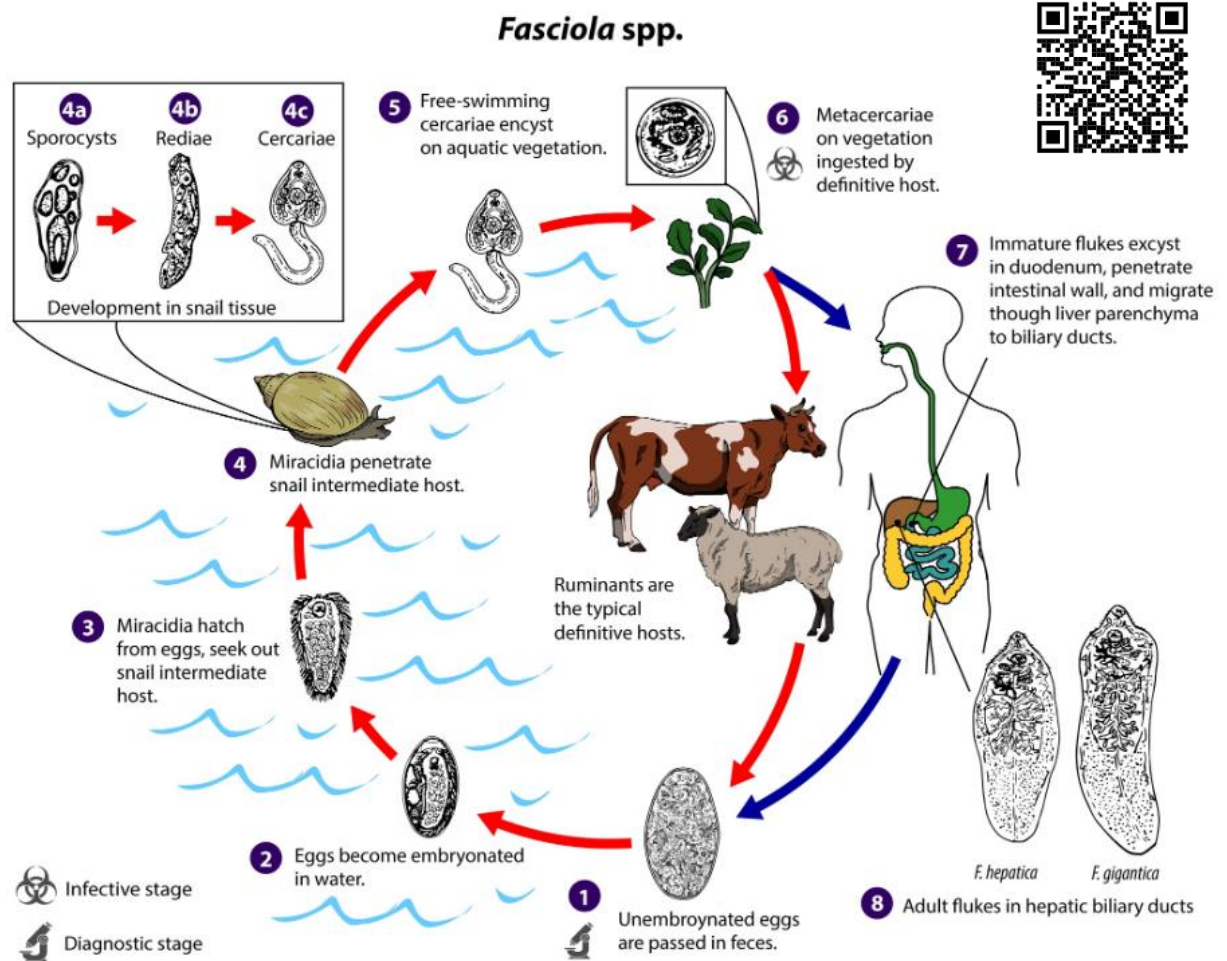
- Human **fasciolosis** is an important public health problem.

### Human infection is determined by

1. The presence of the intermediate **snail** hosts.
  2. Domestic herbivorous animals. الحيوانات العشبية المحلية.
  3. Climatic conditions. الظروف المناخية.
  4. The dietary habits of man. العادات الغذائية للإنسان.
- Sheep, goats and cattle are considered the predominant animal reservoirs. While other animals can be infected, they are usually not very important for human disease transmission.
  - Humans are infected by ingestion of aquatic plants that contain the infected **metacercariae**.
  - Several species of aquatic vegetables (watercress) are known as a vehicle of human

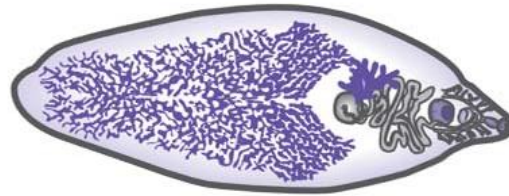
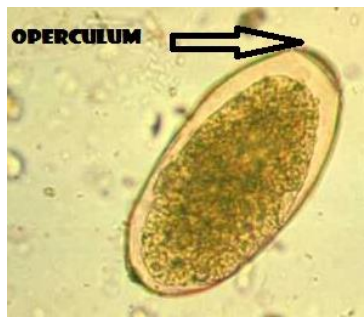
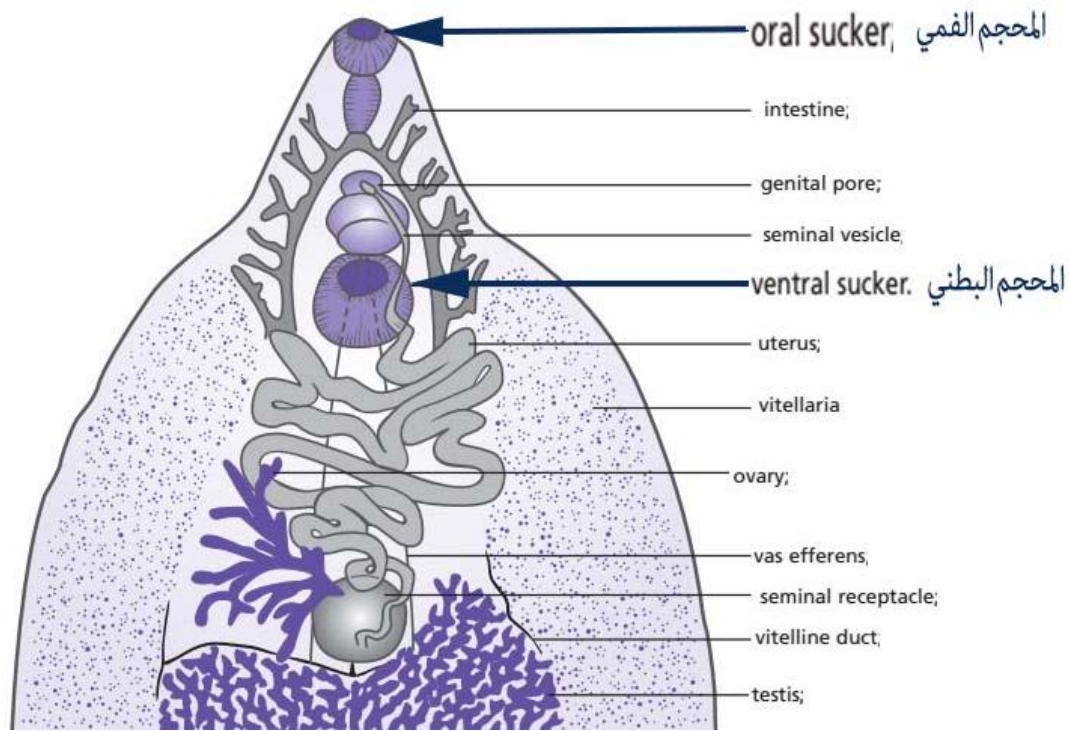
## Infection.

- Because *F. hepatica* cercariae also encyst on water surface, humans can be infected by drinking of fresh untreated water containing **metacercariae**.
- In addition, an experimental study suggested that humans consuming raw liver dishes from fresh livers infected with juvenile flukes could become infected



## Morphology

- The Adult Worm - Averaging 30mm in length and 13 mm in width, *Fasciola hepatica* is one of the largest flukes in the world.
- The adult worm has a very characteristic **leaf shape** with the anterior end being broader than the posterior end and an **anterior cone-shaped projection**.
- The fluke possesses a powerful **oral sucker** at the end of the anterior cone and a **ventral sucker (acetabulum)** at the base of the cone which allow it to attach to the lining of the biliary ducts.
- Each worm possesses ovaries and testes which are highly branched and allow for individual flukes to produce eggs independently.
- The Egg of *F. hepatica* is operculated and average 140  $\mu\text{m}$  in length and 75  $\mu\text{m}$  in width



## In humans

- The course of fasciolosis in humans has **4 main phases**:
- **Incubation phase**: from the ingestion of metacercariae to the appearance of the first symptoms; time period: few days to 3 months; depends on **number of ingested metacercariae** and **immune status of host**.
- **Acute phase**: fluke migration up to the bile ducts. This phase is a result of mechanical destruction of the hepatic tissue and the peritoneum by migrating juvenile **صغير** flukes causing localized and generalized toxic and allergic reactions

### The major symptoms of this phase are:

1. **Fever**: usually the first symptom of the disease; 40-42°C o Abdominal pain
2. **Gastrointestinal disturbances**: loss of appetite شهية, flatulence انتفاخ, nausea غثيان, diarrhea اسهال
3. **Urticaria** حساسية في الجلد
4. **Hepatomegaly and splenomegaly** تضخم الكبد و الطحال



5. **Ascites** تجمع السوائل في تجويف الجسم تسبب انتفاخ البطن

6. **Anaemia** فقر الدم

7. **Jaundice** ابرو صفار اليرقان

• **Latent phase:** This phase can last for months or years. Symptoms in this phase are unknown.

• **Chronic or obstructive phase:** This phase may develop months or years after initial infection.

1. Adult flukes in the bile ducts cause inflammation and hyperplasia of the epithelium. The resulting cholangitis التهاب القناة الصفراوية and cholecystitis التهاب المرارة, combined with the large body of the flukes, are sufficient to cause mechanical obstruction of the biliary duct.
  2. In this case, the gall bladder المرارة is usually enlarged and edematous متوذمة with thickening of the wall.
  3. Lithiasis تكون حصى of the bile duct or gall bladder is frequent and the stones are usually small and multiple.
- A pharyngeal form of the disease, known as **halzoun**, has been described in the Middle East and results from eating raw animal liver infected with *Fasciola*. Young adult worms attach to the pharyngeal mucosa, causing pain, bleeding, and edema that sometimes interfere with respiration.

## Diagnosis

- The most widely used diagnostic approach is **direct detection of *Fasciola* eggs**, by light-microscopic examination of stool or of duodenal or biliary aspirates. However, egg production typically does not start until approximately **3 to 4 months** after the exposure, whereas **antibodies to the parasite** may become detectable **2 to 4 weeks postexposure**.
- A **cautionary note** is that *Fasciola* eggs can be difficult to distinguish on the basis of morphologic criteria from the eggs of *Fasciolopsis buski*, which is an intestinal fluke.
- **False fascioliasis (pseudofascioliasis)** refers to the presence of *Fasciola* eggs in the stool because of recent ingestion of contaminated liver (containing noninfective eggs).

## Treatment

The drug of choice is **triclabendazole**. The drug is given by mouth, usually in two doses. Most people respond well to the treatment.

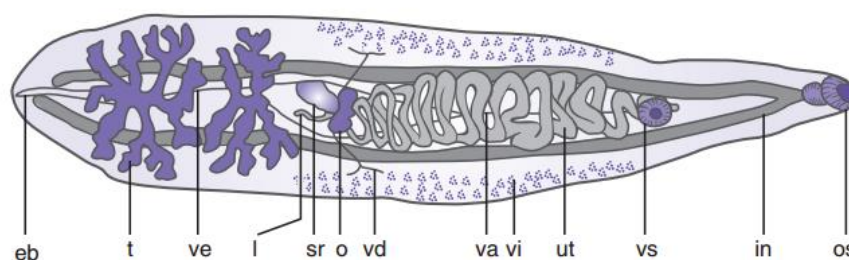




## *Clonorchis sinensis*

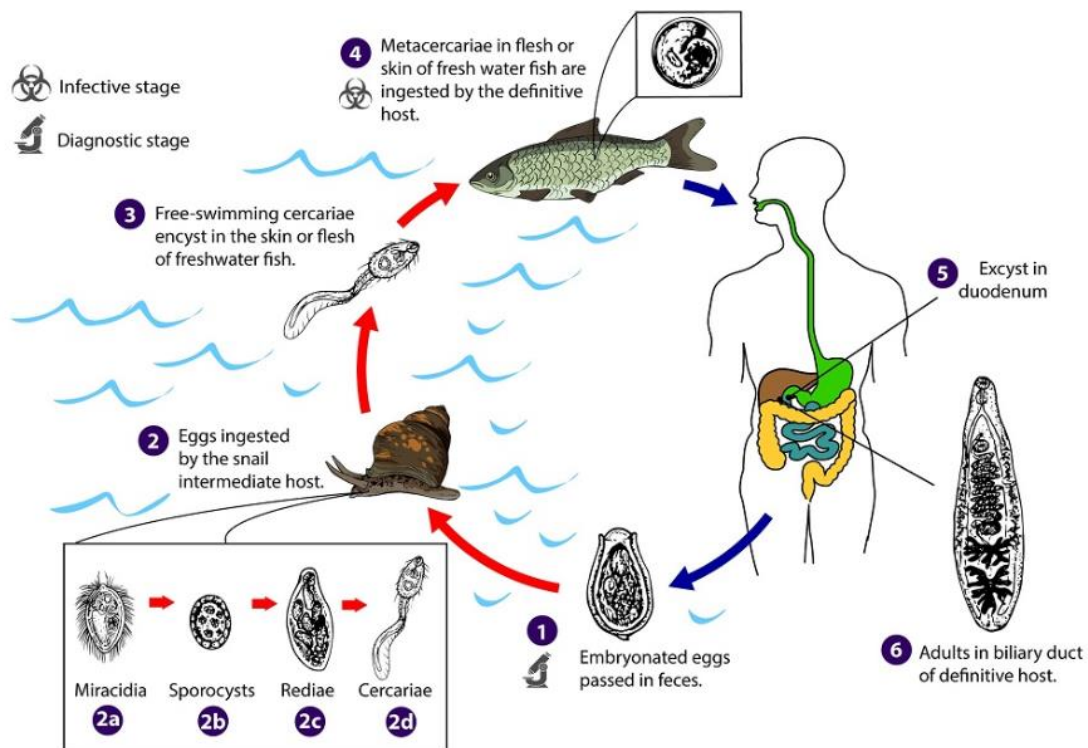
*Clonorchis sinensis*: the **Chinese or oriental liver fluke**. This species is monoecious, having both male and female reproductive systems.

- The *Clonorchis sinensis*: is a human liver fluke in the class Trematoda, Phylum Platyhelminthes, this parasite lives in the liver of humans, and is found mainly in the common bile duct and gall bladder, feeding on bile.
- **Morphology** It is of moderate size, from 1 to 2.5 cm by 0.3 to 0.5 cm. It is broadest in the midportion of the body, tapering toward both ends.
- **Endemic** to Japan. China. Taiwan, and Southeast Asia.
- Most infected persons have no symptoms, infections that last a long time can result in severe symptoms and serious illness. Infections are not known to last longer than 25–30 years, the lifespan of the parasite.
- **Infection:** The eggs of *Clonorchis* are ingested by snails in fresh water. After the eggs hatch, infected snails will release microscopic larvae that can enter freshwater fish. People become infected when eating raw or undercooked fish that contains the **encysted metacercariae**. After ingestion, the liver flukes grow to adult worms that live inside the human bile duct system. The life cycle takes three months to complete in humans.
- **Diagnoses:** Eggs are found in the feces, and as the average daily output per worm is probably more than 2400 eggs.



■ *Clonorchis sinensis*; (eb) excretory bladder; (in) intestine; (l) Laurer's canal; (o) ovary; (os) oral sucker; (sr) seminal receptacle; (t) testis; (ut) uterus; (va) vas deferens; (vd) vitelline duct; (ve) vas efferens; (vi) vitellaria; (vs) ventral sucker. Drawing made with the aid of a camera lucida.

## ***Clonorchis sinensis***



### **Effects on human health**

Dwelling in the bile ducts *Clonorchis* induces:

1. An inflammatory reaction.
2. Epithelial hyperplasia.
3. Cholangiocarcinoma.

The incidence of which is raised in fluke-infested areas.

### **Adverse effects of clonorchis**

- The adult metacercaria to consume all bile created in the liver
- Inhibit the host human from digesting, especially fats.
- Obstruction of the bile duct by the parasite or its eggs.
- leading to biliary obstruction and cholangitis (specifically oriental cholangitis).

### **Treatment**

• Drugs used to treat infestation include:

1. Triclabendazole.
2. Praziquantel
3. Bithionol
4. Albendazole and mebendazole.