

Introduction to Helminthes

Helminthes which occur as parasites in humans belong to two phyla:

*Phylum : Platyhelminthes

* Phylum : Nematodes

General characteristics

- 1- Helminthes or parasitic worms are multicellular, bilaterally symmetrical , elongated, flat or round animals.
- 2- Most helminthic worms are macroscopic in size and often visible to naked eye.
- 3- Larval forms of these worms include :
 - a) Rhabditiform , filariform and microfilaria in nematodes .
 - b) Cysticercus , cysticercoid, coracidium, proceroid, plerocercoid and hydatid cyst in cestodes.
 - c) Miracidium , sporocyst , redia , cercaria and metacercaria in trematodes.
- 4- All helminthes with a few exceptions produce eggs.
- 5- Life cycle of helminthes may be completed in one or more than one host :
 - a) Trematodes complete their life cycle in onè definitive host (man) and two intermediate hosts : fresh water snail and fish or crab as second intermediate host.
 - b) Cestodes with the exception of Hymenolepis nana complete their life cycle in two different host .For most of the cestodes man is the definitive host but for Echinococcusgranulosus man act as intermediate host.

c) Nematodes complete their life cycle in one definitive host except in filarial nematodes and *Dracunculus medinensis*, which complete their life cycle in man and insect vector as second host for former and Cyclops as second host for the latter.

Phylum Nematoda

- 1- Nematodes are unsegmented
- 2- Diecious worm (sex separated) which are filiform.
- 3- They have a body cavity.
- 4- Complete alimentary canal with an anteriorly terminal mouth and posteriorly subterminal anus ,no circulatory system , a simple excretory system and a body wall consisting of an outer layer of longitudinal muscles .

Phylum Platyhelminthes

- 1-The Platyhelminthes or flatworm are dorsoventrally flattened, leaf-like or tape-like .
- 2- Alimentary canal is incomplete or entirely lacking.
- 3- Body cavity is absent .
- 4- They are mostly hermaphrodites (monoecious). Human pathogenic helminthes of this phylum belong to two classes : the **Trematoda** and **Cestioidea**.

Phylum : Platyhelminthes

Class : Trematoda (Flukes)

- 1- The trematodes ,or flukes ,constitute one class of the phylum platyhelminthes.
- 2- All have complex life cycles requiring one or more intermediate host
- 3- Most are hermaphrodite and capable of self- fertilization.
- 4- Eggs laid by the adult within the vertebrate host pass outside and a larva develops within them

- 5- A complex series of generation follows within the mollusk, resulting finally in the liberation of large number of larvae known as cercaria
- 6- A ciliated miracidium larvae hatches from the egg enter a snail and develops into a sac-like sporocyst, germ-cells inside this primary sporocyst form secondary larval- stages which burst out and invade new tissues of the snail, usually the digestive gland, here they develop into either redia with a primitive gut, or secondary sporocysts germ cells inside these develop into tailed cercaria which escape from the snail into the water.
- 7- Most trematodes are described as leaf-shaped ,but they vary considerably in form.
- 8- There are two suckers or attachment organs an anterior one (the oral sucker) surrounding the mouth, and a posterior one (the ventral sucker) on the ventral surface
- 9- Trematodes eggs have a smooth hard shell that is transparent and generally yellow brown spine may be present.
- 10- In the vertebrate host , adult flukes live in the digestive tract ducts associated with the alimentary canal, in the blood, lung, gall- bladder, urinary bladder, or in almost any other organ of the animal or human body .

phylum Platyhelminthes

class : Trematoda

Fasciola hepatica, (liver fluke or sheep liver fluke):

Is a parasitic flatworm (a type of helminth) that infects the livers of various mammals, including humans. The disease caused by the fluke is called fascioliasis which is a type of helminthiasis . F. hepatica is distributed worldwide, and causes great economic losses in sheep and

cattle. It has been known as an important parasite of sheep and cattle for hundreds of years. Because of its size and economic importance, it has been the subject of many scientific investigations and may be the best-known of any trematode species.

Morphology:

Fasciola hepatica is one of the largest flukes of the world, reaching a length of 30 mm and a width of 13 mm. It is leaf-shape, pointed posteriorly, and wide anteriorly, although the shape varies somewhat. The oral sucker is small but powerful and is located at the end of a cone-shape projection at the anterior end. The ventral sucker is larger than the oral sucker and is anterior. The tegument is covered with large, and scale-like spines. The intestinal ceca are highly branched and extend to near the posterior end of the body. The testes are large and greatly branched, arranged in tandem behind the ovary. The smaller, dendritic ovary lies on the right side, coiling between the ovary and the pre-acetabular cirrus pouch. Vitelline follicles are extensive, filling most of the lateral body and becoming confluent behind the testes.

Life cycle

To complete its life cycle, *F. hepatica* requires a freshwater snail as an intermediate host, in which the parasite can reproduce asexually. Species in the family Lymnaeidae that serve as naturally or experimentally intermediate hosts of *Fasciola hepatica*. Adult lives in small passages of the liver of many kinds of mammals, especially ruminants. Humans are occasionally infected.

The flukes feed on the lining of biliary ducts. Their eggs are passed out of the liver with bile and into the intestine to be voided with feces. If they fall into water, eggs will complete their development into miracidia and hatch in 9 to 10 days during warm weather. Colder water retards their development. On hatching, miracidia have 24 hours in which they have to find a suitable snail host. Mother sporocysts produce first-

generation rediae, which in turn produce daughter rediae that develop in the snail's digestive gland. From the snail, minute cercariae emerge and swim through pools of water in pasture, and encyst as metacercariae on near-by vegetation. From here, the metacercariae are ingested by the ruminant or, in some cases, by humans eating uncooked foods such as watercress. Contact with low pH in the stomach causes the early immature juvenile to begin the process **of excystment**. In the duodenum, the parasite breaks free of the **metacercariae** and burrows through the intestinal lining into the peritoneal cavity. The newly excysted juvenile does not feed at this stage, but, once it finds the liver parenchyma after a period of days, feeding will start. This immature stage in the liver tissue is the pathogenic stage, causing anaemia and clinical signs sometimes observed in infected animals. The parasite browses on liver tissue for a period of up to six weeks, and eventually finds its way to the bile duct, where it matures into an adult and begins to produce eggs. Up to 25,000 eggs per day per fluke can be produced, and, in a light infection, up to 500,000 eggs per day can be deposited onto pasture by a single sheep.

Epidemiology

Infection begins when metacercaria, infected aquatic vegetation is eaten or when water containing **metacercariae** is drunk. Humans are often infected by eating watercress. Human infections occur in parts of Europe, northern Africa, Cuba, South America, and other locales. It is one of the most important disease agents of domestic stock throughout the world and shows promise of remaining so for years to come.

Pathology

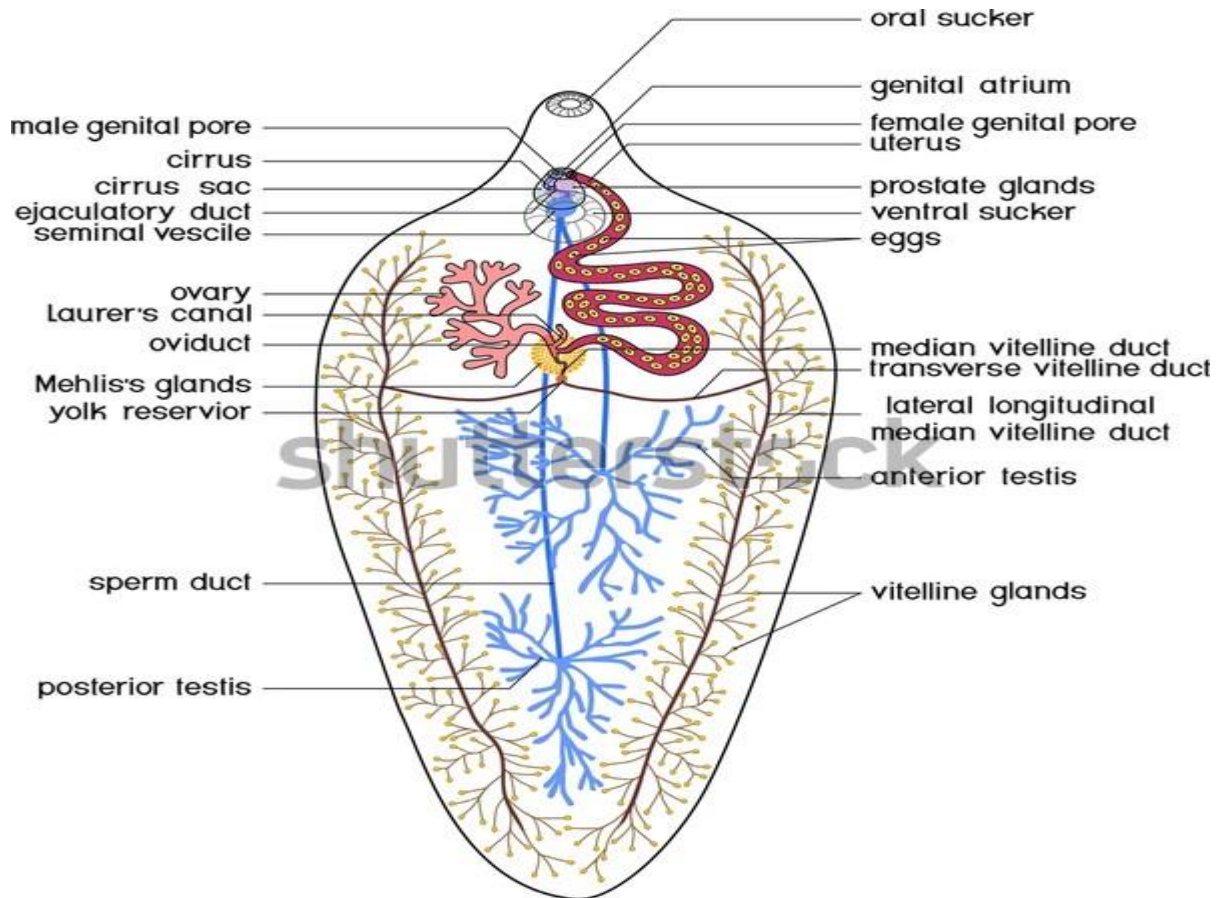
Little damage is done by juveniles penetrating the intestinal wall and the capsule surrounding the liver but much necrosis results from migration of flukes through the liver parenchyma. During this time, they feed on liver cells and blood. Anemia sometimes results from heavy infections.

Worms in bile ducts cause inflammation and edema, which in turn stimulate production of fibrous tissue in the walls of these ducts. Thus thickened, the ducts can handle less bile and are less responsive to needs of the liver. Back pressure causes atrophy of liver parenchyma, with concomitant cirrhosis and possibly jaundice. In heavy infections, the gallbladder is damaged, and walls of the bile ducts are eroded completely

Diagnosis and treatment

Specific diagnosis depends on finding eggs in the stool. A false record can result when the patient has eaten infected liver and egg passes through the feces. Daily examination during a liver-free diet will unmask the false diagnosis. An enzyme-linked immunosorbent assay (ELISA) test is available, which can detect anti-hepatica antibodies in serum and milk, . Several drugs are effective in chemotherapy of fascioliasis, both in humans and in domestic animals. One of these, rafoxanide .The drug of choice in the treatment of fasciolosis is triclabendazole, a member of the benzimidazole.

Fasciola
hepatica



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F. hepatica, egg: the operculum unembryonated can be open. Eggs and contain a granular material .



Fasciola spp.

