

PLATYHELMINTHES

This phylum contains the two classes of parasitic flatworms, the Trematoda and the Cestoda.

Class TREMATODA

- This class divided into two main subclasses, **Monogenea**, which have a direct life cycle, found mainly as external parasites of fish, **Digenea**, which require an intermediate host. And found in vertebrates and considerable veterinary importance.

- The adult digenetic trematodes, commonly called 'flukes', occur in the bile ducts, alimentary tract and vascular system. Most flukes are flattened dorsoventrally, have a blind alimentary tract, suckers for attachment and hermaphrodite. The eggs pass out of the final host, usually in faeces or urine, and the larval stages develop in intermediate host. For a few species, a second intermediate host is involved. There are many families veterinary importance Fasciolidae, Dicrocoeliidae, Paramphistomatidae, and Schistosomatidae.

STRUCTURE AND FUNCTION OF DIGENETIC TREMATODES

1-The adult possesses two suckers for attachment. The oral sucker at the anterior end surrounds the mouth and the ventral, as the name indicates, is on that surface. The body surface is a tegument which is absorptive and is often covered with spines. The muscles lie immediately below the tegument. There is no body cavity and the organs are packed in a parenchyma.

2-The digestive system is simple, the oral opening leading into a pharynx, oesophagus and a pair of branched intestinal caeca which end blindly. The excretory system consists of a large number of ciliated flame cells.

The structure of *Fasciola hepatica*.

3-The trematodes are usually hermaphrodite and both cross- and self-fertilization may occur. The male reproductive system

consists of a pair of testes each leading into a vas deferens: these join to enter the cirrus sac containing a seminal vesicle and the cirrus, a primitive penis which terminates at the common genital opening. The female system has a single ovary leading into an oviduct which is expanded distally to form the ootype. There the ovum acquires a yolk from the secretion of the vitelline glands and ultimately a shell. As the egg passes along the uterus, the shell becomes hardened and toughened and is finally extruded through the genital opening adjacent to the ventral sucker. The **mature egg** is usually yellow because of the tanned protein shell and most species have an operculum food .

4-The **miracidium**, propelled through the water by its cilia, does not feed and must, for its further development, find a suitable snail within a few hours. It is believed to use chemotactic responses to 'home' on the snail and, on contact, it adheres by suction to the snail and penetrates its soft tissues aided by a cytolytic enzyme. The entire process of penetration takes about 30 minutes after which the cilia are lost and the miracidium develops into an elongated sac, the **sporocyst**, containing a number of germinal cells. These cells develop into **rediae** which migrate to the hepato-pancreas of the snail .

5-Typically the **cercariae** swim for some time, utilizing even a film of water, and within an hour or so attach themselves to vegetation, shed their tails and encyst. This stage is called a **metacercaria**.

6-**Encysted metacercariae** have great potential for survival extending to months. Once ingested, the outer cyst wall is removed mechanically during mastication. Rupture of the inner cyst occurs in the intestine and depends on a hatching mechanism, enzymatic in origin, triggered by a suitable oxidation reduction potential and a CO .

Family FASCIOLIDAE

Genus: 1-*Fasciola hepatica*

Hosts: Most mammals; sheep and cattle are the most important.
Intermediate hosts: Snails of the genus **Lymnaea** The most common, *L. truncatula*.

Site: The adults are found in the bile ducts and the immature flukes in the liver parenchyma. Occasionally aberrant flukes become encapsulated in other organs, such as the lungs.

Distribution: Worldwide.

2-Fasciola gigantica

Hosts: Most mammals

Intermediate hosts:Snails of the genus *Lymnaea*; in southern Europe it is *L.auricularia*.

Site:The adults are found in the bile ducts and the immature flukes in the liver parenchyma.

Distribution:-

Most contries .Doesnot occur in western Europe.

LIFE CYCLE

1-**Eggs** passed in the faeces of the mammalian host develop and hatch releasing motile ciliated **miracidia**. This takes nine days at optimal temperatures of 26'C and little development occurs below 10'C.

2-The liberated **miracidium** has a short life and locate a suitable snail within three hours if successful penetration of the latter is to occur.In infected snails, development proceeds through the **sporocyst** and **redial** stages to the final stage in the intermediate host.

3-The **cercaria**; these are shed from the snail as motile forms which attach themselves to firm surfaces, such as grass blades, and encyst there to form the **infective metacercariae** It takes a minimum of 6-7 weeks for completion of development from miracidium to metacercaria, although under unfavourable circumstances a period of several months is required. Infection of a snail with one **miracidium** can produce over 600

metacercariae.

4-**Metacercariae** ingested by the final host excyst in the small intestine, migrate through the gut wall, cross the peritoneum and penetrate the liver capsule. The young flukes tunnel through the parenchyma for 6-8 weeks, then enter the small bile ducts where they migrate to the larger ducts and occasionally the gall bladder . The prepatent period is 10-12 weeks.

The minimal period for completion of one entire life cycle of *F. hepatica* is therefore 17-18 weeks.

The longevity of *F. hepatica* in untreated sheep may be years; in cattle it is usually less than one year.

EPIDEMIOLOGY

There are three main factors influencing the production of the large numbers of metacercariae necessary for outbreaks of fasciolosis.

(1)**Availability of suitable snail habitats:** *L.truncntida* prefers wet mud to free water, and permanent habitats include the banks of ditches or streams and the edges of small ponds. Following heavy rainfall or flooding, temporary habitats may be provided by hoof marks, wheel ruts or rain ponds. Fields with clumps of rushes are often suspect sites.

(2) **Temperature:** A mean day/night temperature of 10°C or above is necessary both for snails to breed and for the development of *F. hepatica* within the snail, and all activity ceases at 5°C. This is also the minimum range for the development and hatching of *F. hepatica* eggs. However, it is only when temperatures rise to 15 °C and are maintained above that level, that a significant multiplication of snails and fluke larval stages ensues.

(3) **Moisture:** The ideal moisture conditions for snail breeding and the development of *F.hepatica* within snails are provided when rainfall such conditions are also essential for the development of fluke eggs, for miracidia searching for snails and for the dispersal of cercariae being shed from the snails.

PATHOGENESIS AND CLINICAL SIGNS

OVINE FASCIOLOSIS

Fasciolosis may be acute, sub-acute or chronic.

Acute disease: occurs 2-6 weeks after the ingestion of large numbers of metacercariae, usually over 2000, and is due to the severe haemorrhage which results when the young flukes, migrating in the liver parenchyma, rupture blood vessels. Damage to the liver parenchyma is also severe.

At necropsy the liver is enlarged, haemorrhagic and honeycombed with the tracts of migrating flukes. The surface, particularly over the ventral lobe, is frequently covered with a fibrinous exudate. Subcapsular haemorrhages are common and these may rupture so that a quantity of blood-stained fluid is often present in the abdominal cavity.

- Outbreaks of acute fasciolosis are generally presented as sudden deaths during autumn and early winter. On examination of the remainder of the flock, one may find some sheep which are weak, with pale mucous membranes, dyspnoeic and in some instances have palpable enlarged livers associated with abdominal pain and ascites.

Chronic fasciolosis: which is seen mainly in late winter/early spring, is the most common form of the disease. It occurs 4-5 months after the ingestion of moderate numbers, 200-500, of metacercariae. The principal pathogenic effects are anaemia and hypoalbuminaemia and more than 0.5 ml blood per fluke can be lost into the bile ducts each day. Additional loss of plasma proteins occurs by leakage through the hyperplastic biliary mucosa and the pathogenic effect is exacerbated if the sheep is on a low plane of nutrition.

At necropsy the liver has an irregular outline and is pale and firm, the ventral lobe being most affected and reduced in size. The liver pathology is characterized by hepatic fibrosis and hyperplastic cholangitis.

- Clinically, chronic fasciolosis is characterized by loss of condition and the development of anaemia and hypoalbuminaemia which can result in emaciation, pallor of the

mucous membranes, submandibular oedema and ascites. The anaemia is hypochromic and macrocytic with an accompanying eosinophilia. *Fasciola* eggs can be demonstrated in the faeces.

Laboratory diagnosis

1- Definitive diagnosis is made by observing the ova in faeces by sedimentation, since the flukes are very prolific any significant infection will be easily picked up.

2- Serological techniques are available for the diagnosis of *Fasciola hepatica*:

-The first is the estimation of plasma levels of enzymes released by damaged liver cells by enzymes are usually measured.

Glutamate dehydrogenase (GLDH)

-The second is the detection of antibodies against components of flukes, the ELISA and the passive haemagglutination test being the most reliable.

Treatment :

- At present there is only one drug, namely triclabendazole, in early acute stages.

- used for subacute or chronic fasciolosis are rafoxanide and nitroxylnil and several others

-Albendazole is also effective at an increased dosage rate.

CONTROL

1-Reduction of snail populations before any scheme of snail control is undertaken a survive of the area for snail habitats should be made to determine whether these are localized or widespread.

2- Removing fluke populations at a time of heavy burdens or at a period of nutritional and pregnancy stress to the animal. Since the timing of treatments is based on the fact that most metacercariae appear in autumn and early winter, it may require modification for use in other areas.

-In late April/early May treat all adult sheep with a drug effective against

adult and late immature stages. At this time, products containing both a fasciolicide and a drug effective against nematodes which contribute to the periparturient rise (PPR) in faecal egg counts in ewes may be used.

-In wet years further doses may be necessary as follows:

In June, 4-6 weeks after the April/May dose, all adult sheep should be treated with a drug effective against adult and late immature flukes.

-In October/November, 4 weeks after the early October dose, treat all sheep with a drug effective against parenchymal stages.

F . gigantea	F . hepatica
The parasite larger in size	The parasite is smaller in size
The anterior cone is smaller	The anterior cone is larger
The shoulder is not broad	The shoulder is broader than F. gigantea
Duration of life cycle is long in definitive host	Duration of life cycle is short in definitive host
The intermediate host <i>Lymnaea auricularia</i>	The intermediate host <i>Lymnaea truncatula</i>
The duration of development in the snail is long	The duration of development in the snail is short
The flukes are abundant in tropical countries	The flukes are abundant in temperate countries