

FASCIOLA HEPATICA

the sheep liver fluke was the first trematode to have been discovered as early as 1379 by de Brie. It is the largest and most common liver fluke found in humans, but its primary host is the sheep, and to a less extent cattle. It is worldwide in distribution, being found mainly in sheep-rearing areas. It causes the economically important disease 'liver rot' in sheep.

Morphology and Life Cycle

—The adult worm lives in the biliary tract of the definitive host for many years about 5 years in sheep and 10 years in humans. It is a large leaf-shaped fleshy fluke 30 mm long and 15 mm broad, grey or brown in colour. It has a conical projection anteriorly and is rounded posteriorly. The eggs are large, ovoid, operculated, bile stained and about 140 μm by 80 μm in size. They are laid in the biliary passages and shed in feces. The embryo matures in water in about 10 days and the miracidium escapes. It penetrates the tissues of intermediate host, snails of the genus *Lymnaea*. In snail, the miracidium progresses through the sporocyst, the first and second generation redia stages to become the cercariae in about 1 to 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. Sheep, cattle or humans eating watercress or other water vegetation containing the metacercaria become infected. The metacercariae excyst in the duodenum and pierce the gut wall to enter the peritoneal cavity. They penetrate the Glisson's capsule, traverse the liver parenchyma and reach the biliary passages, where they mature into the adult worms in about

(months (Fig. 9.9 4-3

Textbook of Medical Parasitology 130

FIGURE 9.9B: Life cycle of *Fasciola hepatica*. 1. Adult in biliary tract of sheep and humans. 2. Egg passed in stools reaches water. 3. Miracidium escapes and penetrates tissues of snail in which it develops successively into 4

Sporocyst and 5. Redia first generation and 6. Second generation. 7. Cercaria released into water encysts on water plants to become 8. Metacercaria which is infective to definite hosts by ingestion

FIGURE 9.9A

Pathogenicity

Fascioliasis differs from clonorchiasis in that *F. hepaticus* is larger and so causes more

mechanical damage. In traversing the liver tissue it causes 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. Patients

present initially with fever, eosinophilia and tender hepatomegaly. Later they develop

acute epigastric pain, obstructive jaundice and anaemia. Cholelithiasis is a common

late complication

Trematodes: Flukes 131

Occasionally, ingestion of raw liver of infected sheep results in a condition called halzoun (meaning suffocation). The adult worms in the liver attach to the pharyngeal

mucosa causing oedematous congestion of the pharynx and surrounding areas, leading

to dyspnoea, dysphagia, deafness and rarely asphyxiation. However, this condition

is more often due to pentastome larvae. Halzoun is particularly common in Lebanon

.and other parts of the Middle East and North Africa

Diagnosis

.Demonstration of eggs in feces or aspirated bile is the best method of diagnosis
,Eosinophilia is constantly present. Serological tests such as immunofluorescence
.immunoelectrophoresis and complement fixation may be helpful

Treatment

Oral bithionol is the treatment of choice. Intramuscular emetine has been used
.successfully

Prophylaxis

Health education, preventing pollution of water courses with sheep, cattle and
human

feces, and proper disinfection of watercresses and other water vegetations before
.consumption can limit the infection

F. gigantica, a related species is a common parasite of herbivores in Africa and
.has caused occasional human infection. It is also prevalent in Indian herbivores

DICROCOELIUM DENDRITICUM

Known also as the 'lancet fluke' because of its shape, *D. dendriticum* is a very
common

biliary parasite of sheep and other herbivores in Europe, North Africa, Northern

.Asia and parts of the Far East. Eggs passed in feces are ingested by land snails

Cercariae appear in slime balls secreted by the snails and are eaten by ants of the
genus *Formica*, in which *metacercariae* develop. Herbivores get infected when they
they

accidentally eat the ants while grazing. Reports of human infection have come
from

Europe, Middle East and China. However, spurious infection is more common. In the latter, the eggs can be passed in feces for several days by persons eating infected

.sheep liver

Eurytrema pancreaticum, a related fluke is commonly present in the pancreatic duct

of cattle, sheep and monkeys. Occasional human infection has been noticed in China

.and Japan

INTESTINAL FLUKES

A number of flukes parasitise the human small intestine. These include *Fasciolopsis*

buski, *Heterophyes*, *Metagonimus yokogawai*, *Watsonius watsoni* and *Echinostoma*. Only one

.(fluke *Gastrodiscoides hominis* parasitises the human large intestine (Fig. 9.10

Textbook of Medical Parasitology 132

.Fig. 9.10: Some intestinal flukes and their eggs

Fasciolopsis buski 2. *Gastrodiscoides hominis* .1

Heterophyes heterophyes .3

FASCIOLOPSIS BUSKI

History and Distribution

Also called the giant intestinal fluke, *Fasciolopsis buski* is the largest trematode infecting

humans. It was first described by Busk in 1843 in the duodenum of an East Indian sailor who died in London. It is a common parasite of man and pigs in China and

.in South East Asian countries. In India it occurs in Assam and Bengal

Morphology and Life Cycle

The adult is a large fleshy worm, 20 to 75 mm long and 8 to 20 mm broad. It is elongated ovoid in shape, with a small oral sucker and a large acetabulum. It has no cephalic cone as in *F. hepatica*. The adult lives in the duodenum or jejunum and

.has a lifespan of about 6 months. The operculated eggs are similar to those of *F. hepatica*. Eggs are laid in the lumen of the intestine in large numbers, about 25,000

per day. The eggs passed in feces hatch in water in about 6 weeks, releasing the miracidia which swim about. On contact with a suitable milluscan intermediate ,host

snails of the genus *Segmentina*, they penetrate its tissues to undergo development

in the next few weeks as sporocyst, first and second generation rediae and .cercariae

The cercariae which escape from the snail encyst on the roots of the lotus, bulb of the water chestnut and on other aquatic vegetation. When they are eaten, the metacercariae excyst in the duodenum, become attached to the mucosa and develop

.into adults in about 3 months

Trematodes: Flukes 133

Pathogenicity

The pathogenesis of fasciolopsiasis is due to traumatic, mechanical and toxic .effects

Larvae that attach to the duodenal and jejunal mucosa cause inflammation and local

ulceration. In heavy infections, the adult worms cause partial obstruction of the .bowel

.Intoxication and sensitisation also account for clinical illness

The initial symptoms are diarrhoea and abdominal pain. Toxic and allergic symptoms appear, usually as oedema, ascites, anaemia, prostration and persistent

.diarrhoea

Diagnosis

History of residence in endemic areas suggests the diagnosis which is confirmed by demonstration of the egg in feces, or of the worms after administration of a

.purgative

Treatment

Hexylresorcinol and tetrachlorethylene have been found useful. Dichlorophen and .praziquantel are effective

Prophylaxis

Adequate washing of water vegetables, preferably in hot water affords protection against infection. Preventing contamination of ponds and other waters with pig or human excreta, sterilisation of night soil before use as fertiliser, and anti-snail measures

.help in limiting the infection

HETEROPHYES

This is the smallest trematode parasite of man, measuring about 1.5 mm in length and 0.3 mm in breadth. The definitive hosts, besides humans, are cats, dogs, foxes and other fish eating mammals. The infection is prevalent in the Nile Delta, Turkey .and in the Far East. The worm has been reported in a dog in India

.The adult worm lives in the small intestine and has a lifespan of about 2 months
The minute operculated egg 30 μm by 15 μm are passed in faeces and hatch after
ingestion by intermediate molluscan host, snails of the genera *Pironella* and
.Cerithidea
After passing through the sporocyst and one or two redia stages, the cercariae
escape
and encyst on suitable fishes, such as the mullet and tilapia. When the infected
fish
.are eaten raw or inadequately cooked, the definitive hosts become infected
.In the small intestine, it can induce mucous diarrhoea and colicky pains
Occasionally, the worms burrow into the gut mucosa, and their eggs are carried
in the lymphatic and portal circulation to ectopic sites such as the brain, spinal
cord
and myocardium, where they induce granulomas. Rarely the worms themselves
may
.be carried to these sites as emboli

Textbook of Medical Parasitology 134

METAGONIMUS YOKOGAWAI

This minute worm, generally resembling *H. heterophyes* occurs in the Far East,
Northern
Siberia, Balkan states and Spain. The definitive hosts are humans, pigs, dogs, cats
and pelicans. The first intermediate host is a fresh water snail and the second a
.fish. Definitive hosts are infected by eating raw fish containing the metacercariae
Pathogenic effects consist of mucous diarrhoea and ectopic lesions in
myocardium
and central nervous system as in heterophyiasis. A number of other heterophyid

.worms can cause occasional human infections

WATSONIUS WATSONI

This trematode infects various primates in Asia and Africa. Only one instance of .human infection has been reported

ECHINOSTOMA

,Echinostomes are medium sized flukes causing small intestinal infection in Japan Philippines and all along the Far East. The worm is less than 20 mm long and 2 .mm wide

The characteristic feature is a crown of spines on a disc surrounding the oral ,sucker

justifying its name 'echinostoma' which means 'spiny mouth '. Its eggs resemble those

of fasciolopsis. Mild infections are asymptomatic, but diarrhoea and abdominal pain

.follow heavy infection. E. ilocanum is the species usually seen in human infections

GASTRODISCOIDES HOMINIS

G. hominis is the only fluke inhabiting the human large intestine. It was discovered by Lewis and McConnell in 1876 in the caecum of an Indian patient. It is a common

human parasite in Assam. Cases have also been reported from Bengal, Bihar and Orissa. It also occurs in Vietnam, Philippines and some parts of erstwhile USSR. Pigs

.are the reservoir hosts. Monkeys have been found naturally infected

The adult worm is pyriform, with a conical anterior end and a discoidal posterior part. It is about 5-14 mm long and 4-6 mm broad. The eggs are operculated and measure 150 μm by 70 μm . The miracidia invade the tissues of the intermediate

molluscan host. The cercariae encyst on water plants. Infected persons develop mucoid

.diarrhoea. Tetrachlorethylene is useful in treatment

LUNG FLUKES

PARAGONIMUS WESTERMANI

History and Distribution

Also known as the Oriental lung fluke, *Paragonimus westermani* was discovered in by Kerbert in the lungs of Bengal tigers that died in the zoological gardens 1851

Trematodes: Flukes 135

at Hamberg and Amsterdam. The parasite is endemic in the Far East—Japan, Korea

Taiwan, China, and South East Asia—Sri Lanka and India. Cases have been reported

.from Assam, Bengal, Tamil Nadu and Kerala

.*P. mexicanus* an important human pathogen in Central and South America

Morphology and Life Cycle

.The adult worm is egg-shaped about 10 mm long, 5 mm broad and 4 mm thick

Adults worms live in the lungs, usually in pairs in cystic spaces that communicate with bronchi. They have a lifespan of up to 20 years in humans. Besides humans

other definitive hosts include cats, tigers, leopards, foxes, dogs, pigs, beavers, civetcats, mongoose and many other crab-eating mammals

The eggs are operculated, golden brown, about 100 µm by 50 µm. Eggs escape into the bronchi and are coughed up and voided in sputum or swallowed and passed

in faeces. The eggs mature in about 2 weeks and hatch to release free-swimming

miracidia. These infect the first intermediate molluscan host, snails belonging to the

genera *Semisulcospira* and *Brotia*. Cercariae that are released from the snails after several weeks are microcercus, having a short stumpy tail. The cercariae that swim

about in streams are drawn into the gill chambers of the second intermediate crustacean host, crabs or crayfish. They encyst in the gills or muscles as .metacercariae

Definitive hosts are infected when they eat such crabs or crayfish raw or inadequately

cooked. The metacercariae excyst in the duodenum and the adolescaria penetrate

the gut wall reaching the abdominal cavity in a few hours. They then migrate up through the diaphragm into the pleural cavity and lungs finally reaching near the bronchi, where they settle and develop into adult worms in 2 to 3 months (Figs and 9.12). The worm is hermaphroditic but usually it takes two for 9,11 .fertilisation

Sometimes the migrating larvae lose their way and reach ectopic sites such as .the mesentery, groin or brain

Pathogenicity

In the lungs the worms lie in cystic spaces surrounded by a fibrous capsule formed by the host tissues. The cysts, about a centimetre in diameter are usually in

FIGURE 9.11: *P. westermani* morphology

Textbook of Medical Parasitology 136

.FIGURE 9.12: Life cycle of *Paragonimus westermani*. 1

Adult in human or animal lung. 2. Egg shed in sputum or

.stools reaches water, infects the first intermediate host

.Snail in which it develops into 4. Sporocyst. 5. Redia .3

first generation. 6. Redia. second generation, which releases 7. Cercaria with short slumpy tail. It enters the second intermediate host, crab or other crustaceans, in which it encysts to become 8. Metacercaria, which is infective for definitive hosts by ingestion

communication with a bronchus. Inflammatory reaction to the worms and their eggs

lead to peribronchial granulomatous lesions, cystic dilatation of the bronchi, abscesses

and pneumonitis. Patients present with cough, chest pain and haemoptysis. The viscous

sputum is speckled with the golden brown eggs. Occasionally, the haemoptysis may

.be profuse. Chronic cases may resemble pulmonary tuberculosis

Paragonimiasis may also be extrapulmonary, the clinical features varying with the site affected. In the abdominal type there may be abdominal pain and .diarrhoea

.The cerebral type resembles cysticercosis and may cause Jacksonian epilepsy

.Glandular involvement causes fever and multiple abscesses

Diagnosis

.Demonstration of the eggs in sputum or faeces provides definitive evidence

,Complement fixation test is positive only during and shortly after active infection

.while the intradermal test remains positive for much longer periods