Trematodes

lec. 4 د.اسماء زکي شيتاوي

Intestinal flukes

Several genera of intestinal flukes cause human infection, particularly in the Far East. Fasciolopsis buski, Heterophyes heterophyes, Metagonimus yokogawai Infection is usually asymptomatic unless the worm burden is large.

Fasciolopsis buski

Distribution

It is a common parasite of humans and pigs in China, in Southeast Asian countries and Indian subcontinent, especially in areas where humans raise pigs and consume freshwater plants.

Disease : fasciolopsiasis

Morphology

Adult warm: It is the largest of the intestinal trematodes. The adult is a large fleshy worm, 20-75 mm long, 8-20 mm broad and 0.5-3 mm in thickness.

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 worm has a lifespan of about 6 months.





Egg :The operculated eggs are similar to those of *Fasciola hepatica*. Eggs are laid in the lumen of the intestine in large numbers, about 25,000 per day. Pass Unembryonated.



Life cycle :

F. buski passes its life cycle in **definitive host** and **two intermediate**

host.

Habitat The adult worm lives in the duodenum or jejunum of pigs and humans.

Infective stage encysted metacercaria

Infection is acquired by ingestion of raw water chestnuts or caltrop

1st Intermediate host fresh water snail

2nd intermediate host water plants water chestnut

Infective form: Encysted metacercariae on aquatic vegetation.
The eggs passed in feces of definitive host hatch in water in about 6 weeks, releasing the miracidia which swim about.

• On coming in contact with a suitable snails of the, miracidia penetrates 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 or on other aquatic vegetation.

• When they are eaten by man, the metacercariae excysts in the duodenum, become attached to the mucosa and develop into adults in about 3 months.



Pathogenesis and Clinical Features

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. Intoxication and sensitization also account for clinical illness.

In heavy infections, the adult worms cause partial obstruction of the bowel, malabsorption, protein-losing enteropathy and impaired vitamin B12 absorption.

- The initial symptoms are diarrhea and abdominal pain.
- Toxic and allergic symptoms appear usually as edema, ascites, anemia, prostration and persistent diarrhea.
- Paralytic ileus is a rare complication.



Prevention and Control

1. Treatment of infected cases

2. Wash water vegetation, preferably in hot water or cook well before consumption

3. Prevent contamination of ponds and other water sources with pig or human excreta

4. Control of snails

Heterophyes heterophyes and Metagonimus yokogawai

Heterophyes This is the smallest intestinal trematode of human (*smallest trematode*)

Distribution *H. heterophyes* is found in China, Egypt, India, Iran, Israel, Japan, Korea, Sudan, the Philippines, Tunisia, and Turkey

M. yokogawai is found in the Balkans (a cultural region of southeastern Europe), China, Indonesia, Israel, Japan is considered the most common intestinal fluke infection in the Far East.

Disease : heterophyiasis

Morphology

Adult *H. heterophyes* worms range in size from 1.0 to 1.7 mm in length and 0.3 to 0.4 mm in width. The worm is also pyriform in shape, with tapering at the anterior end and rounding at the posterior end. It has an extra powerful muscular sucker around the genital pore called genital sucker. *Metagonimus* has the same morphology but slightly larger





The eggs are small, yellow-brown, embryonated, and operculated and may have minimal opercular shoulders. Eggs range in size from 26 to 30 μ m long and 15 to 17 μ m wide and may be indistinguishable between the two species.



Life cycle

Habitat: adult worm in duodenum and jejunum

Definitive hosts: humans, pigs, dogs and cats.

Intermediate hosts:

The first intermediate host is the freshwater snail

The second intermediate host is the freshwater fish.

Infective stage encysted metacercaria

Adults release embryonated eggs each with a fully-developed miracidium,

After ingestion by a suitable snail (first intermediate host), the released miracidia develop into cercariae. The cercariae are released from the snail and encyst as metacercariae in the tissues of a suitable fresh water fish (second intermediate host). The definitive host becomes infected by ingesting undercooked or salted fish containing metacercariae. After ingestion, the metacercariae excyst, attach to the mucosa of the small intestine and mature into adults.



Pathogenicity and clinical presentation

Infections with a small number of worms may be asymptomatic.

Symptoms in heavy infections may include abdominal pain, diarrhea with a large amount of mucus, and ulceration of the intestinal wall. Eggs may gain entry into the intestinal capillaries and the lymphatic system, where they can be carried to the heart, brain, spinal cord, or other tissues, causing emboli or granuloma formation.

Prevention

Infection can be prevented by avoiding ingestion of raw, inadequately cooked, and pickled or salted fish. The risk of infection could be greatly reduced by improved sanitary conditions and health education programs.

Laboratory Diagnosis of intestinal flukes

Identification of the intestinal trematodes is made by recovery of eggs, or in rare cases adults, from stool specimens using a sedimentation method such as formalin-ethyl acetate. The sediment may be examined in a wet mount with or without iodine.

Because the eggs of *F. buski* are identical to those of *F. hepatica*, and those of *H. heterophyes* and *M. yokogawai* are very similar, diagnosis may also require assessment of symptoms, obtaining a travel history, and/or recovery of adult worms.

Treatment

The drug of choice for treatment of intestinal trematode infection is praziquantel, an isoquinoline derivative administered orally in three doses for 1 day.

Lung Fluke

Paragonimus westermani

Common name Oriental lung fluke

Distribution

The parasite is endemic in Japan, Korea, Taiwan, China and Southeast Asian countries.

Disease paragonimiasis

Morphology

The adult worm is coffee bean shaped about 10 mm long, 5 mm broad and 4 mm thick. It is reddish brown in colour. It has an oral sucker and a ventral sucker. It has a lifespan of up to 20 years in humans. The eggs are operculated with opercular shoulders, golden brown in colour and about 100 μ m by 50 μ m in size thick shelled. Eggs are unembryonated when freshly laid.



Life Cycle

Habitat Adult worms live in the lungs in cystic lesion
Definitive host man, dogs, pigs
1st Intermediate host fresh water snail
2nd intermediate host crustacean (crayfish, crab)
Infective stage encysted metacercaria

Mode of infection: Man acquires infection by eating undercooked crab or crayfish containing **metacercariae**.

• The adult worms live in the respiratory tract of the definitive host.

• Unembryonated eggs escape into the bronchi and are coughed up and voided in sputum or swallowed and passed in feces.

• The eggs mature in about 2 weeks and hatch to release free-swimming miracidia.. These infect the first *intermediate host* (*snail*)

• Cercariae that are released from the snails 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 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 in the vicinity of the **bronchi**, where they develop into adult worms in 2-3 months.

The worm is hermaphroditic but usually it takes 2 for fertilization. Sometimes, the migrating larvae lose their way and reach ectopic sites such as the mesentery, groin and brain.



Pathogenicity and Clinical Features

Pulmonary features: In the lungs, the worms lie in cystic spaces surrounded by a fibrous capsule formed by the host tissues.

Inflammatory reaction to the worms and their eggs lead to **peribronchial granulomatous** lesions, cystic dilatation of the bronchi, abscesses, pneumonitis and eosinophilia.

• Patients present with cough, chest pain and **hemoptysis.** The viscous sputum is speckled with the golden-brown eggs. Occasionally, the hemoptysis may be profuse.

• Chronic cases may resemble pulmonary tuberculosis.

Extrapulmonary features: The clinical features depend on the site of involvement.

• *Abdominal paragonimiasis:* Occasionally the fluke migrates to liver and intestinal wall resulting in enlarge liver, abdominal tenderness and bloody diarrhea.

• *Cerebral paragonimiasis:* Encapsulated cyst of *Paragonimus* is found in brain and spinal cord. Symptoms include headache, fever, paralysis, visual disturbances and convulse seizures.

Diagnosis

1. Microscopic examination

Detection of the eggs in sputum,

The egg may be observed in the feaces (if the patient swallows the eggs).

Or in the tissue of other tissue sample

2. Serodiagnosis detection of IgE useful in cerebral infection

3. Molecular diagnosis PCR on clinical specimens.

4. *Biopsy* Identification of species is made when adult or egg is recovered from the lesion in the lungs.

5. imaging CXR and CT scan



Treatment

Praziquantel (25 mg/kg orally 3 times per day for 2 days) is the drug of choice. Bithinol and niclofolan are also effective.

Prevention and Control

- 1. Adequate cooking of crabs and crayfish
- 2. Treatment of infected cases
- 3. Control of snails