

LECTURERS IN VETERINARY PARASITOLOGY

INTRODUCTION, NEMATODA AND SYSTEMIC PLATYHELMINTHES

THIRD YEAR STAGE

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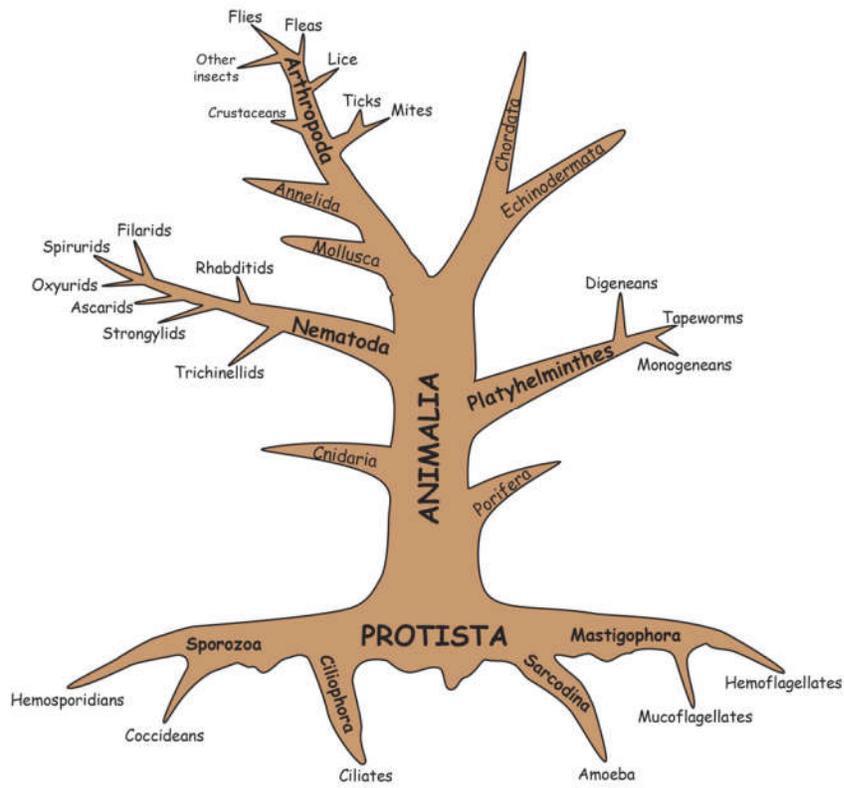
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CHAPTER THREE

SYSTEMATIC PLATYHELMINTHES

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Trematoda can be divided according to the site of infection in the definitive host to:

1- Liver Flukes

2- Intestine Flukes

3- Lung Flukes

4- Blood Flukes

Liver Flukes:

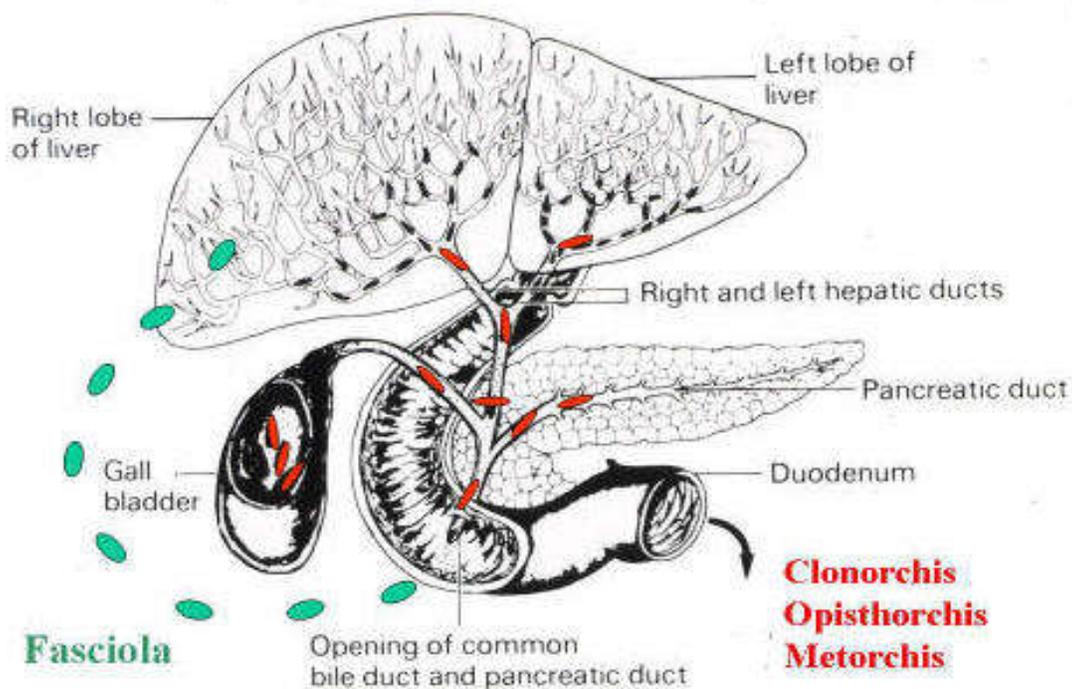


Figure (24): The pathway of liver flukes

1- Family: Fasciolidae: *Fasciola hepatica*, *Fasciola gigantica*

Phylum: Platyhelminthes

Class: Trematodes

Subclass: Digenea

Order: Echinostomatiformes

Family: Fasciolidae

Genus: *Fasciola hepatica*, *Fasciola gigantica*

1. large, leaf-shaped, with cephalic cone
2. mainly in herbivores
3. intestinal caecae, testes, and ovary dendritic

The disease cause Fascioliasis

Intermediate host: fresh water snails

Final host: Cattle

Site of Infection: hepatic and portal vessels

life-cycle

Adults in gall bladder, bile ducts, eggs out with feces, un embryonated, develop in 9-10 days, hatch to miracidia and penetrate several species of snails. Sporocyst; two redial generations, cercaria emerge 5-7 wk post-

infection, encyst as metacercariae on underwater vegetation, ingested; cross gut and penetrate liver (glycocholic acid in bile the stimulus; migration cue), feed in liver for 2 months, then enter bile ducts and after another month, mature and produce eggs.

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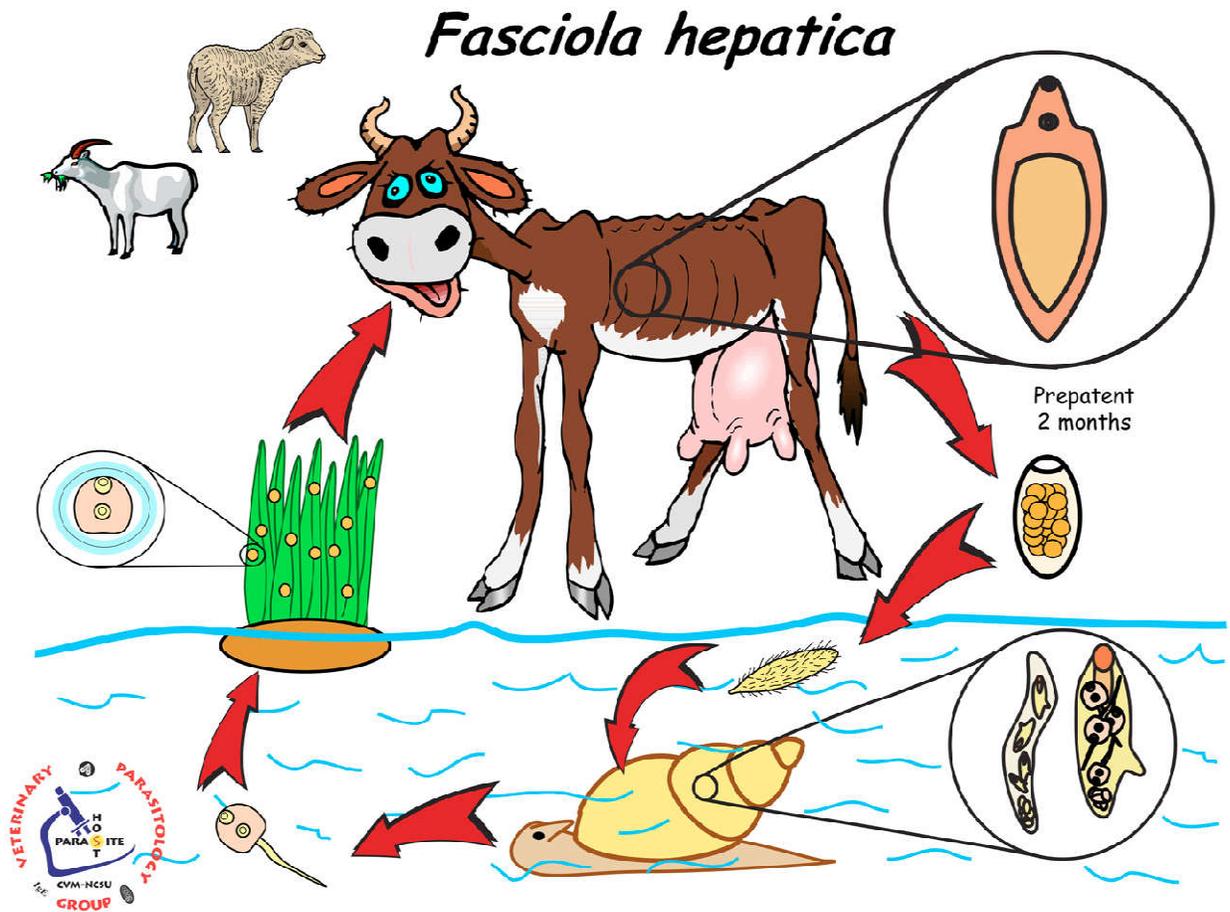


Figure (24): The life cycle of *Fasciola hepatica*

Pathology

- A. inflammation and erosion of bile ducts
- B. tissue destruction of liver
- C. fibrosis of liver and bile duct walls
- D. back pressure in liver, leading to cirrhosis and jaundice
- E. blockage of bile ducts
- F. abscesses in liver
- G. migrating juveniles may cause ectopic abscesses in lungs, brain, skin, eye
- H. halzoun - adults attach in nasopharynx after eating raw liver (middle east)

Symptoms:

- **Acute**
 - More common in sheep
 - 10,000+ Metacercariae consumed at one time
 - Dramatic Liver Inflammation, Frequently Resulting in Death
- **Chronic**
 - More Common and Rarely Fatal
 - Nonspecific Symptoms
- **Halzoun**
 - Eating raw, infected liver
 - Infects pharynx

- Causes swelling and obstructs breathing

Related species

Fasciola gigantica (found in a variety of Artiodactylids in Africa, India, portions of Europe, Indonesia, Asia, and Hawaii. The most common infections occur in cattle, sheep, and goats. Patent infections in humans also occur). Hybrids between this species and *Fasciola hepatica* have been reported.

Fasciola jacksoni (nasty pathology in Asian elephants)

Fasciolopsis buski (swine and humans in Asia).

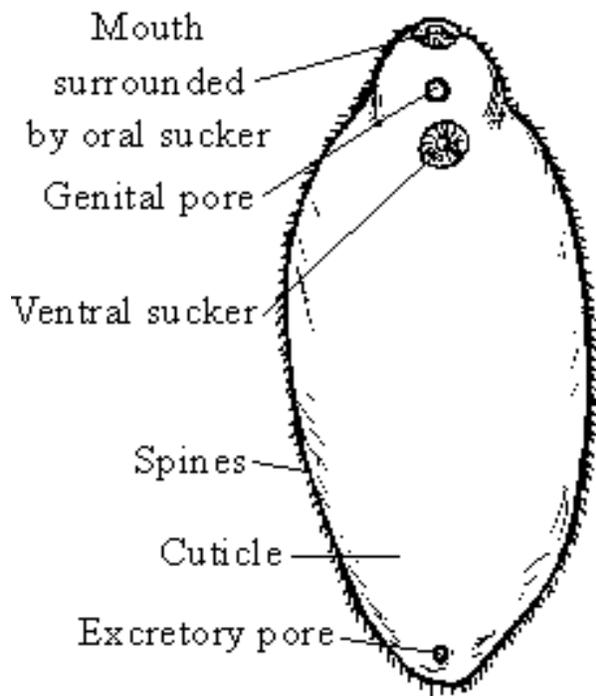


Fig. (11): *Fasciola gigantica* (unstained and stain) worms

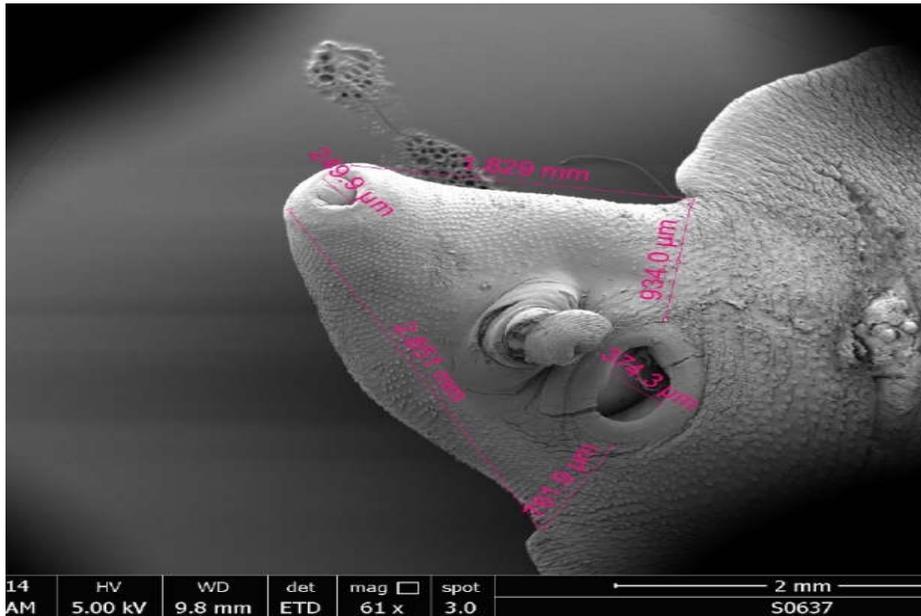


Fig. (12): The apical zone of *Fasciola gigantica* with oral and ventral suckers and genital pore (61 X). By scanning electron Microscope. Prof. Dr. Suzan A. Al-Azizz and Huda S. Farhan

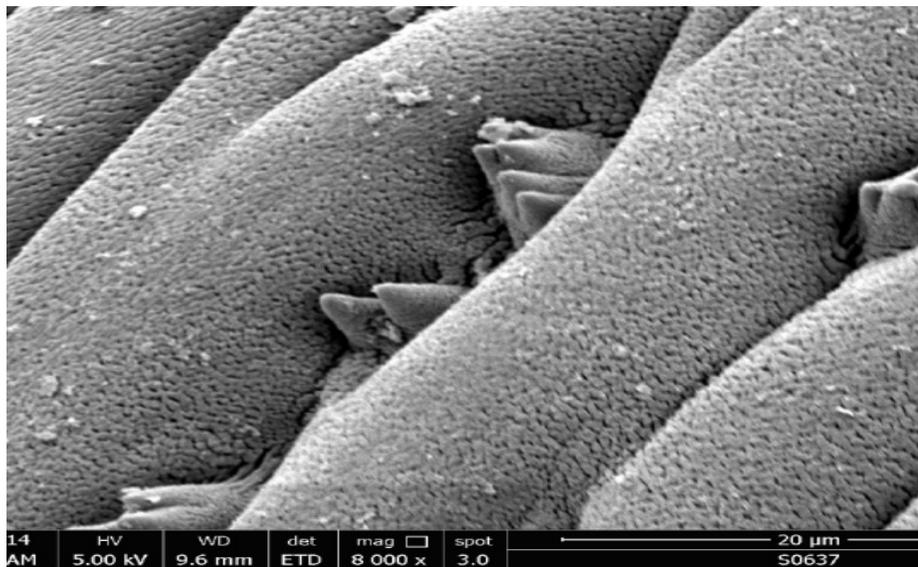


Fig. (13): Spiny tegument of the cirrus genital organ of *Fasciola gigantica* (8000 X). By scanning electron Microscope. Prof. Dr. Suzan A. Al-Azizz and Huda S. Farhan

Treatment:

- **Bithional**
 - Highly Effective
 - Large Dose
 - High Cost
 - Long Treatment Period
- **Triclabendazole**
 - Easier to Use
 - 1-2 Oral Doses in 24 hrs
 - Virtually 100% Effective
- **Surgery**

Order: Plagiorchiiformes

Adults are quite diverse in this order, and many do not resemble one another. Larvae and juveniles share more similarities than adults. Wall of excretory bladder epithelial. Cercaria with simple tail and dorsal finfold. Oral stylet usually present (xiphidiocercariae).

Most species have small eggs and most (but not all) have eggs that must be eaten by snail to hatch and tend to be medium-small worms; most intestinal

Below are some representative species:

***Dicrocoelium dendriticum* (family: Dicrocoeliidae)**

Phylum: Platyhelminthes

Class: Trematodes

Subclass: Digenea

Order: Plagiorchiiforms

Family: Dicrocoeliidae

Genus: *Dicrocoelium*

Species: *D. dendriticum*

The disease called Dicrocolidiasis.

Intermediate host: First: land snails, Second: Ants

Final host: Cattle

Site of infection: portal and hepatic vessels

Synonyms include *Dicrocoelium lanceolatum* and *Distoma dendriticum*. Medium sized, elongate, and flattened worms ("lancet fluke") (ca 6-10 x 1.5-2.5 mm), body pointed at both ends, and cecae simple; ovary post-testicular. Common in Europe and Asia; introduced into Australia and North America.

Life-cycle

Adults in bile ducts, gall bladder, and pancreatic ducts of sheep, cattle, goats, pigs, cervids, lagomorphs, some rodents, and rarely humans, eggs passed embryonated out with feces, eaten by land snails, and about 55 different species of snails have been shown to be suitable hosts then hatch into two sporocyst generations after that xiphidiocercaria accumulate in pulmonary chamber of snail, cercaria aggregate as masses and secrete thin cyst wall. Snail then coats cercaria with mucus, and deposits slime balls containing numerous cercaria (dozens to hundreds) in slime trails, this slime balls eaten by ants. About 17 species and several genera of ants have been found to be suitable second intermediate hosts (in USA, *Formica fusca*); ants love to eat slime balls and even feed them to the larval ants. Most metacercaria encyst in hemocoel and are infective to final host; however, 1-2 encyst in depression between roots of subesophageal nerves leading to mouthparts (never become infective), as temperature decreases in the evening, ants climb up grass and clamp down with mandibles. Uninfected ants return to colony. Paralyzed ants found only at temperatures under 20 C⁰, mandibles release when ants warm up the next morning, so, ruminants graze in evenings and mornings, ingesting these exposed ants, metacercaria excyst in duodenum, migrates up common bile duct and development to adult.



Fig. (14): Adult worm *Dicrocoelium dendriticum*

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Dicrocoelium dendriticum

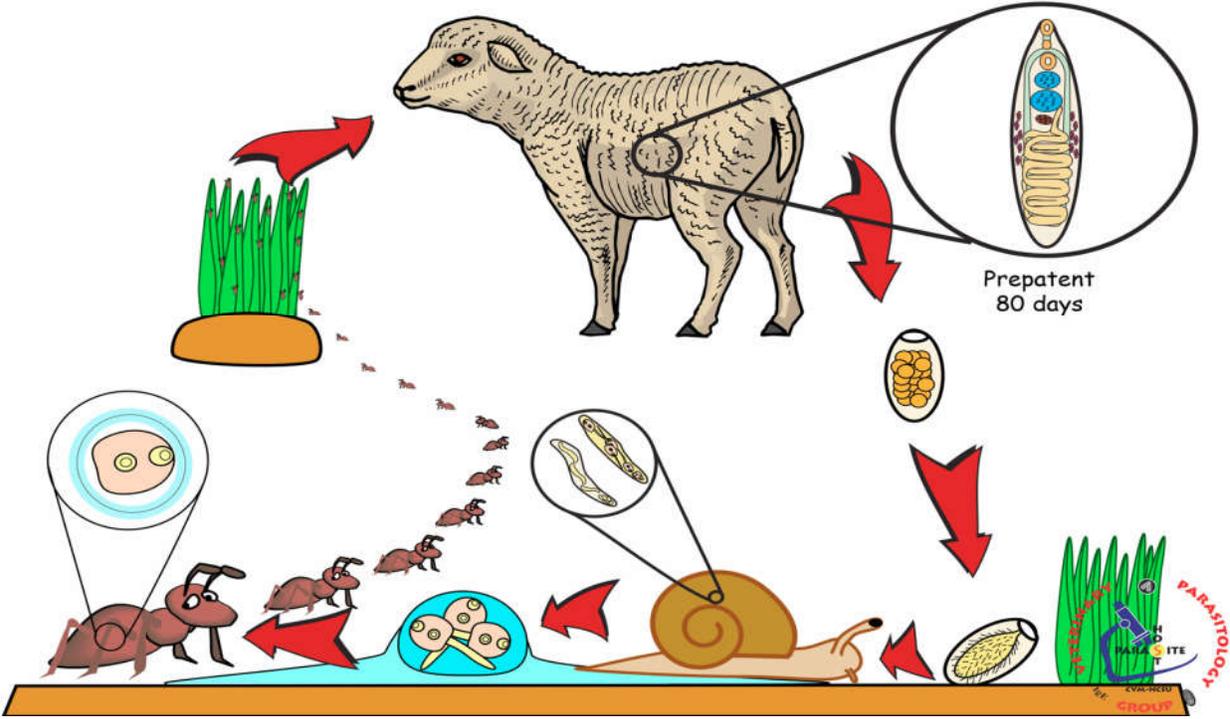


Fig. (15): Life cycle of *Dicrocoelium dendriticum*

Treatment:

- 1- Hexachloroethan and Fouadein, which cutoff ova production from adult worms.
- 2- Hetholein (19-22)mg/Kg. body weight
- 3- Thibendazol (200-300) mg/kg body weight which can kill 96%from adult worms.

Order: Opisthorchiformes

Typically: worms in medium to small size, testes usually posterior, cirrus absent and seminal receptacle present. Eggs passed fully embryonated, while, metacercariae encysted in fish.

***Clonorchis sinensis* (syn. *Opisthorchis sinensis*) (family: *Opisthorchiidae*)**

Phylum: Platyhelminthes

Class: Trematodes

Subclass: Digenea

Order: Opisthorchiforms

Family: Opisthorichidae

Genus: *Opisthorichis*

Species: *O. sinensis*

The disease is Opisthorchiosis

Intermediate host: First: snails, Second: fishes

Final host: Human

Adults of the Chinese liver fluke live in bile ducts, are elongate, 8-20 x 1.5-5 mm. Asiatic in distribution, infecting cats, humans, dogs, badgers, mink, etc. Large, dendritic testes posteriorly that are tandem

Life-cycle

Adults in bile ducts, produce up to 4000 eggs per day; live about 6 months, eggs passed in feces fully embryonated, eaten by snails (most common, *Parafossarulus manchouricus*) one sporocyst and one redial generation, cercaria with eyespots; when contacts solid object swims upward, attaches to fish epithelium; over 100 species of cyprinids suitable, enters through skin, encysts under scales or in muscle as metacercaria. Some crustacea will also support the metacercaria after that fish eaten, so, metacercaria excyst; migrate to common bile duct. Pathologically includes erosion of the biliary epithelium. There is also evidence to suggest that this parasite is probably carcinogenic to humans.

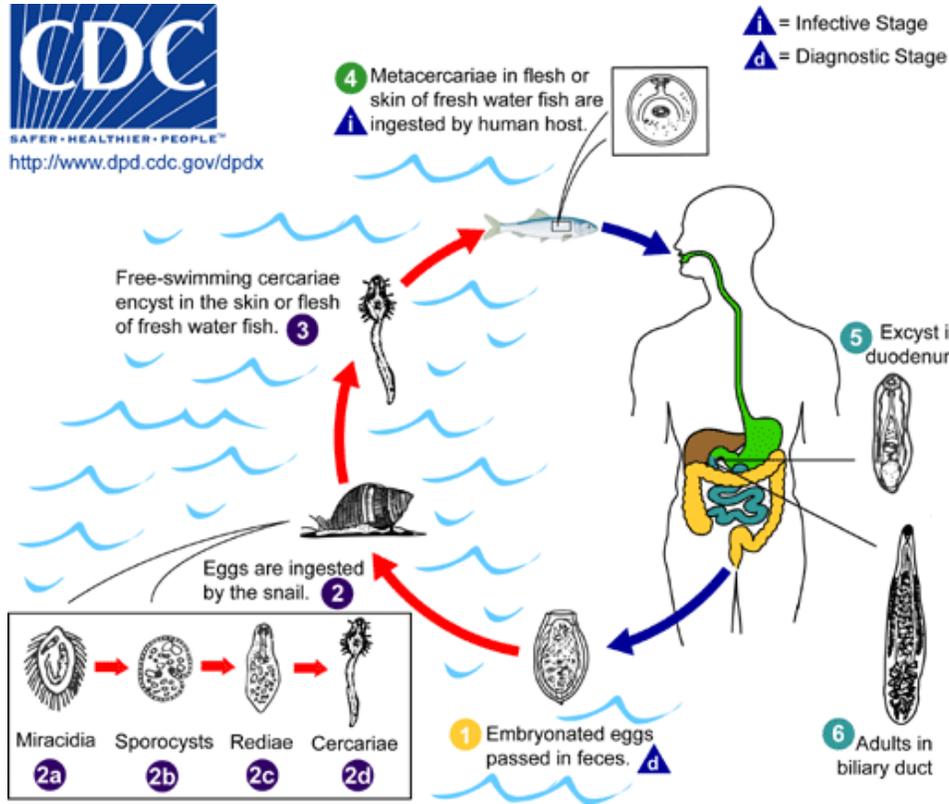


Fig. (16): Life cycle of *Clonorchis sinensis*

***Opisthorchis felineus* (syn. *Opisthorchis tenuicollis*)**

in Europe and Asia, and which also uses a variety of mammals as hosts especially felids, other carnivores, and humans. Evidence is not adequate to conclude that this parasite is a cause of cancer.

Opisthorchis viverrini

in southeast Asia infects up to 10 million humans. Evidence suggests that this parasite can induce cholangiocarcinoma in humans.

Intestinal Flukes

1- Family: Echinostomatidae: *Echinostoma* spp.

Phylum: Platyhelminthes

Class: Trematodes

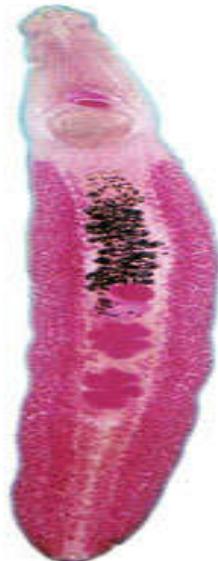
Subclass: Digenea

Order: Echinostomatiformes

Family: Echinostomatidae

Genus: *Echinostoma*

Species: *E. revolutum*



**Fig. (17): Adult worm *Echinostoma*
*sp.***

Intermediate host: First: snails, Second: Fishes, tadpoles, Planaria

Final host: Birds

Site of Infection: Intestine

Tend to be relatively non-host specific in semi-aquatic vertebrates. Many species elongate; anterior sucker and large acetabulum anterior, 27-51 circumoral collar of spines, depending upon species

Life-cycle

Adults in gut, eggs passed in feces, hatch; miracidia penetrate snails , for instance, sporocyst; two redia, cercaria, metacercaria in molluscs, planaria, fish, tadpoles, etc. eaten by definitive host

Typical species

- A. *Echinostoma caproni* (in mammalian and avian hosts; Africa)
- B. *Echinostoma trivolvus* (in mammalian and avian hosts; North America)
- C. *Echinostoma revolutum* (in mammals and birds; Europe and Asia)

Order: Paramphistomiformes

This order often placed as a superfamily of the order Echinostomatiformes. Composed of amphistomes (acetabulum at or near posterior end). Usually thick, fleshy worms. Ovary usually post-testicular

2- Family: Paramphistomidae: *Paramphistomum cervi*

Phylum: Platyhelminthes

Class: Trematodes

Subclass: Digenea

Order: Paramphistomatiforms

Family: Paramphistomidae

Genus: *Paramphistomum* sp.

Cosmopolitan in distribution. Adults in rumen of domestic animals, pinkish in color

Pathogenic; in large numbers can cause intestinal ulceration and death; secondary bacterial infections

Life-cycle

Adults in rumen, eggs out with feces, mature in water to miracidium hatches; penetrates multiple genera of snail hosts, one sporocyst and two redial generations, cercaria encyst on aquatic vegetation, eaten by herbivore, excyst

in duodenum; penetrate gut; migrate through tissues to abomasum, enter lumen and migrate anteriorly to rumen, mature in 2-4 months.



Fig. (18): Adult worm *Paramphistomum cervi* attach in ruminant of the host



Fig. (19): Intermediate host (snail) in the life cycle of *Paramphistomum cervi*

Treatment:

It can be use the drug Hexachloroethan or Pentonine for treat the infected animals as 180 gr./kg. body weight, and using mollescicide as a chemical control to kill the snails (intermediate hosts).