

## F. FASCIOLIDAE

Several species of major importance to human and animal health.

~~\*All members of this family are large leaf-shaped trematodes parasitic in mammals.~~

Characteristics of the family:

- Leaf shaped, very large, large spines in the tegument.
- Dendritic testes and ovary, <sup>extensive</sup> ~~much~~ vitellaria in body behind the acetabulum. <sup>oval</sup>
- Most are Parasitic in the liver [bile ducts] of mammals, one species lives in lumen of intestine.

[1] Fasciola hepatica

- MORPHOLOGY: See handout. -Large 30 mm x 13 mm max.
- Oral cone ends at level of acetabulum where shoulders begin.
- \*Provides immediate identification\*

GENERAL

Annual loss to animal industry is about 10,000,000 dollars due to "rotten liver" or condemned liver due to flukes.

See handout with prevalence of U.S.

The best known species in the family because: known since 1379.

- The first trematode species in which the life cycle was fully worked out.
- occurs in man and domestic animals in a cosmopolitan distribution most important in man in Southern France, Algeria, Cuba, South America.
- Occurs in many different mammals, ~~especially~~ sheep, cattle are the primary definitive host, however rabbits may be a source of infection as reservoir hosts in some areas.

Habitat:

Adults live in the gall bladder and bile ducts of the liver, where they graze on bile duct epithelium.

Eggs pass out of the liver via the bile ducts, and are disseminated into water.

LIFE CYCLE

P305 book

Draw.

-Knowledge of the life cycle is important because with this information, an epidemiologist can trace the source of infection to achieve control.

-Eggs pass into the water, where they hatch releasing a ciliated miracidium. Cold temperatures retard development, and the eggs may remain dormant until spring thaw. *operculated egg hatches.*

Miracidium penetrates snail. [genera Lymnaea, Fossaria, Stagnicola]

*Larva migrates to the*

Mother sporocyst [in digestive gland]

*Draw*

Mother redia

*Draw*

Daughter redia

*Draw*

Cercaria

*- w club shaped tail unforked.*

*Draw*

Metacercaria

Adult [life span -11 yrs]

Epidemiology:

Infection occurs when a mammal ingests vegetation or drinks water containing the metacercaria.

Human infections occur when eating noncooked watercress or other water plants.

Thus, knowledge of both the morphological characteristics of the worm, and the life cycle may allow a quick identification of the source of infection. This is important for veterinarians in the U.S. and doctors in 3rd world countries.

### Pathology:

Metacercaria excyst and penetrate the small intestine where they creep over the viscera of the abdomen. *go thru diaphragm.*

Larvae then penetrate Glisson's capsule (of liver) and burrow through the liver to the bile ducts.

- Ectopic infection is common, the larvae get lost on their migration and stay in the peritoneal cavity or other ectopic foci. They have been found to occur in the eye, brain, skin and lungs where they may produce ulcers.

Humans show symptoms of irritation as the larvae migrate to the liver.

Adult worms can cause the following: *pathologic changes.*

- [1] Hyperplastic change in the epithelium. *(increase cells)*
- [2] Fibrosis in the liver around the bile ducts.
- [3] Massive infections can result in Portal cirrhosis. *hardening of liver around portal vein.*
- [4] Heavy worm burdens may cause fever, epigastric pain, anorexia, enlargement of the liver. Jaundice may be caused by biliary obstruction.
- [5] Worms may invade the parenchyma of the liver by eroding through the epithelial tissue of the bile ducts.
- [6] Secondary bacterial infection may result *from* ~~in~~ heavy infections.
- ~~[7] Migrating juveniles can produce ulcers in various ectopic sites.~~

### Diagnosis:

Eggs in feces, cannot differentiate them from a closely related genus Fasciolopsis or other trematodes of the echinostome lineage.

~~Eggs are 130 - 150 um long by 63 - 90 um wide.~~

Suspect Fasciola when liver blockage coincides with ingestion of watercress.

False diagnosis may result when a person eats sheep or calf liver infected with the trematode, eggs pass through undamaged.

Treatment:

Rafoxanide works by uncoupling oxidative phosphorylation of the fluke.

Others:

Bithionol

Dehydroemetine

Albendazole

Control:

Human infections. Dont eat raw watercress.

Livestock:

- Control intermediate hosts; *molloscicide*
- Pasture rotation ineffective due to reservoir hosts.
- Chemical means of control are generally ineffective because of resistant immature worms, *only mature worms succumb.*

OTHER TREMATODES OF THE GENUS FASCIOLA[1] Fasciola gigantica

- longer more slender (without shoulders) than F. hepatica.
- Nearly identical biological characters of F. hepatica.
- Uses different snail hosts.
- Economically important due to cattle and sheep liver damage.

Distribution:

Africa, Asia, Hawaii.

[2] F. jacksoni

- Parasite of liver of Asian elephants. Pathogenic.

GENUS FASCILOIDES

Fascioloides magna ++(see handout)

Distribution: N. America; Europe.

Hosts: Cervids (deer and elk) Natural definitive host. Cows other host.

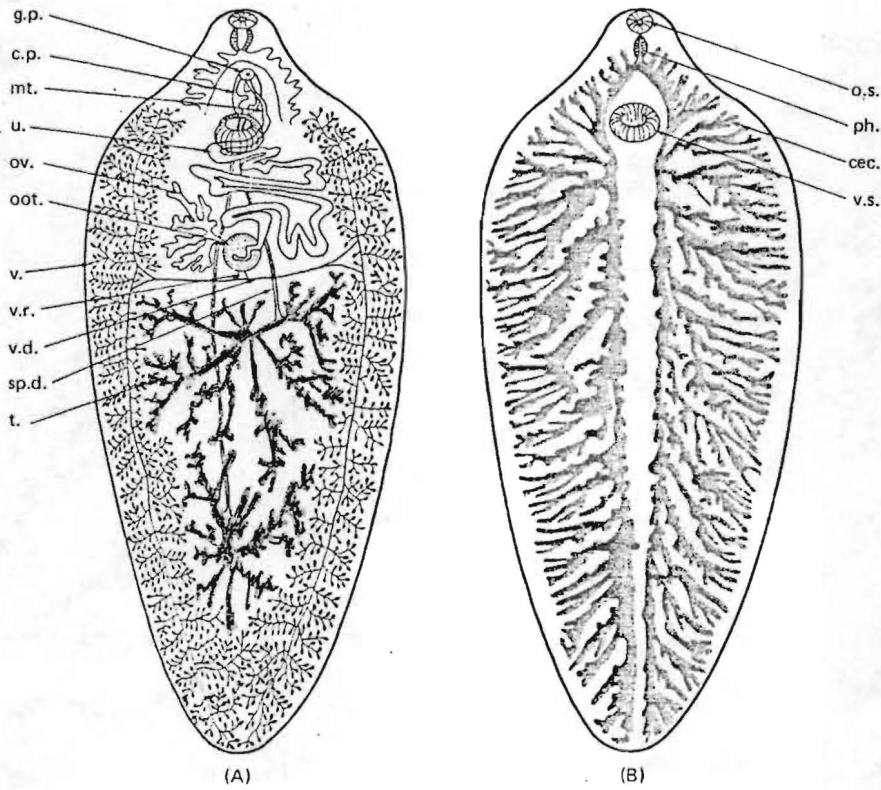
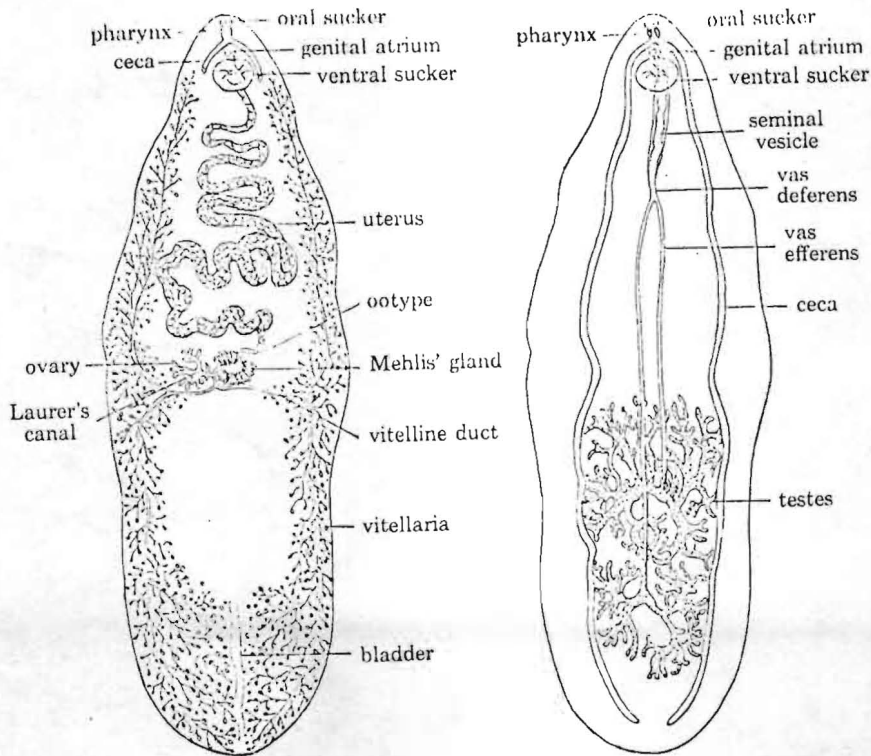


Fig. 3-1. The adult *Fasciola hepatica* from the bile ducts of sheep. A shows the reproductive systems only. B shows the digestive system only. (Redrawn from Chandler and Read, 1960.) Abbreviations: cec., cecum; c.p., cirrus pouch; g.p., gonopore; mt., metraterm; oot., ootype; o.s., oral sucker; ov., ovary; ph., pharynx; sp.d., sperm duct; t., testes; u., uterus; v., vitelloria; v.d., vitelline duct; v.r., vitelline reservoir; v.s., ventral sucker.

Fasciola hepatica  
adult morphology



Fasciolopsis buski  
adult morphology

Morphological characters: Giant -up to 75 mm long, lacks oral cone and no shoulders.

\* \*\*some people collect the flukes and fry them up called "liver butterflies"

Fasciolopsis buski

Morphological characteristics: Largest fluke of humans. No cephalic cone, no shoulders, unbranched ceca, testes branched.

Distribution: Orient, estimated 10,000,000 human cases in 1947, more probably today, *more humans.*

Habitat: Humans and pigs. \*Small intestine\*, attached to epithelium.

Life Cycle: Similar to F. hepatica.

Epidemiology: Produces 25,000 eggs/day.

Human or pig feces must be deposited in water. Night Soil. Control by sewage treatment. or Boil veggies.

Snail hosts: Segmentina and Hippeutis.

Metacercaria encyst on food plants of both pigs and humans.

Pathology: Inflammation of Mucosa and Submucosa of intestine.

- Excess mucus secretion.
- Eosinophilia.
- Blockage of Small intestine in major infections.
- Ulceration, hemorrhage, abcess of duodenum.
- Chronic diarrhea.
- Toxemia-Verminous intoxication.
- ==The abosrption of worm metabloites by the human, can cause death, due to sensitization to the metabolites.

Treatment: Chemicals -Hexylresorcinol, Tetrachloroethylene.

Control: Proper sewage disposal. Cooking of vegetables beforfe eating.

## FAMILY TROGLOTREMATIDAE

[1] Paragonimus westermani Human lung fluke.

Morphological chars: Adults are thick, spinose tegument, wavy ceca (not branched) reddish and coffee bean shaped.

Distribution: Orient, Africa, Possibly S. America.

Habitat: Lungs of humans or other suitable definitive hosts. Pair of worms usually occur in a cyst in the lungs.

Hosts: -Natural definitive host probably are wild carnivores.

## LIFE CYCLE

Eggs coughed up and swallowed or spit out.

Eggs pass into water via sputum or feces.

Miracidium----- (1st int. host--Snail [Semisulcospira])

Mother sporocyst-----Redia-----Cercaria

Metacercaria encyst in body of freshwater crab.

This is called the 2nd intermediate host.

Definitive host eats uncooked crab.

Metacercaria excyst and pent. gut wall

Wander through body cavity for a time.

Eventually, most penetrate the diaphragm and burrow into lungs.

Form cyst with usually 2 in each cyst.

Eggs produced after 2-3 months.

Epidemiology: Humans often eat crab that is pickled, not cooked  
-drunken crab, marinated in wine is also a problem.  
-Crab juice also used for medicinal purposes in Orient.  
-Flukes may live for up to 20 years, thus produce eggs in amazing numbers.

Symptoms: Fever from inflammation in lungs. Rupture of cyst causes coughing.  
-eggs in sputum look like iron filings.  
-possible blood in sputum.  
-Severe chest pain.  
-in heavy infections, severe difficulty in breathing =dyspnea.

Pathology:  
-worms may not reach lungs and encyst in other locations  
-liver, abdomen, muscle subcutaneous tissues, spinal cord, brain.  
-Different pathological effects depending upon site of encystment.  
-Passage of worms through tissue causes hemorrhage.  
-Eggs may reach the pulmonary circulation and be carried to the liver.  
-if worm dies, the cyst will turn fibrous and may calcify.

Diagnosis:

-Eggs in sputum.

Treatment:

Chemical treatment Bithionol.