

Life History of *Fasciola hepatica*

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- ***Faciola hepatica* or Liver fluke is a soft bodded, flattened, lea-like, obligated endoparasitic animal.**
- **Belonging to the class Trematoda of phylum Platyhelminthes**
- **Lives in the larger bile duct of sheep.**
- **Life cycle is digenetic, completed in two host**
- **Primary host is sheep**
- **Secondary host is an amphibian land snail known as *Limnaea truncatula***
- **Life cycle propagated by sexual multiplication.**

Copulation:

- *Faciola* is a hermaphrodite animal and cross fertilization occurs. Two flukes copulate inside the host body.
- During copulation, the sperm along with the prostetic fluid of one individual pass into the Laurer's canal from where these move to the oviduct.
- The alkaline secretion of prostetic glands helps the sperms to move freely while the secretion of Mehlis's glands keep them active for fertilization.

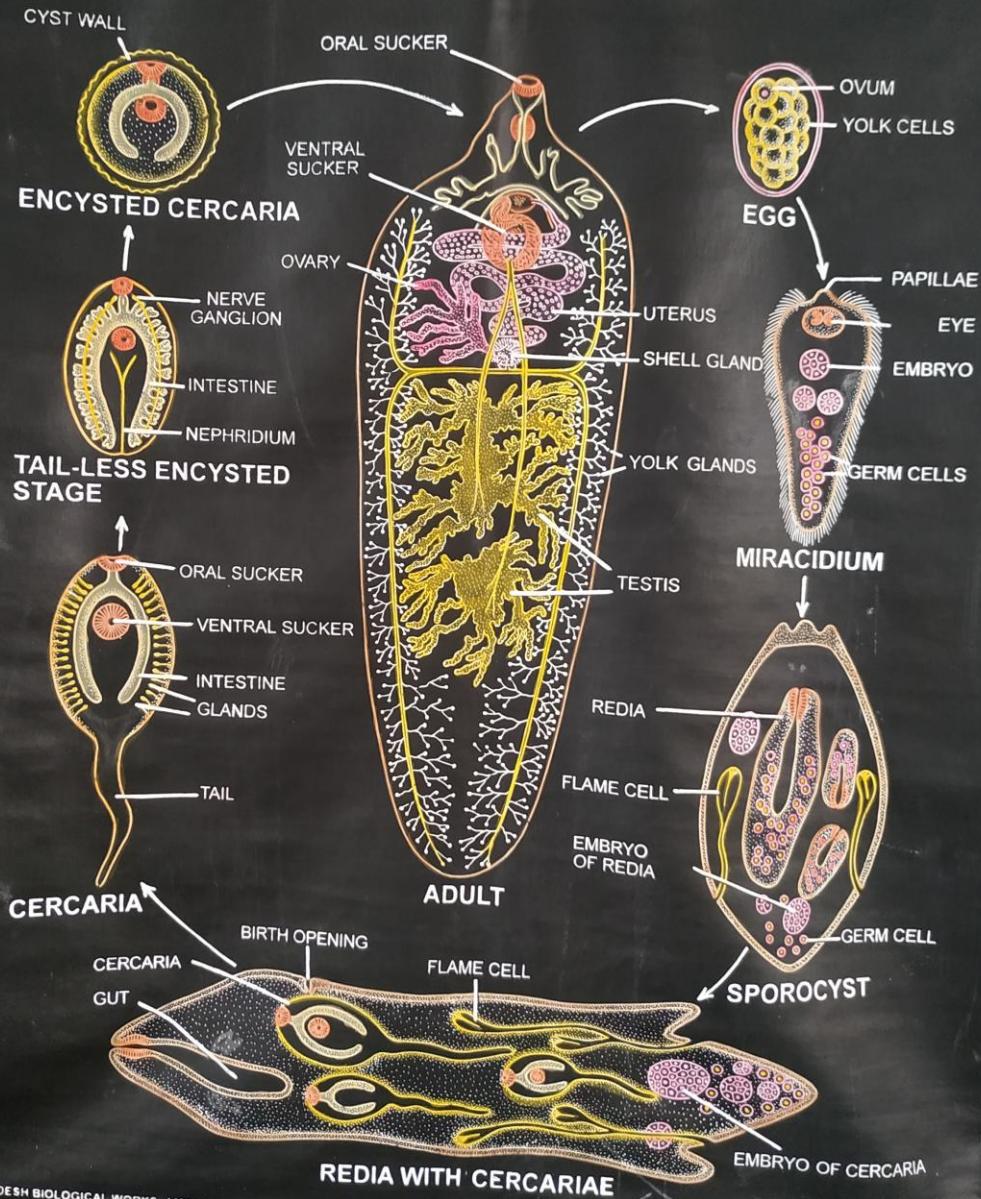
Fertilization:

The eggs are fertilized in the lower part of the oviduct

Capsule formation:

- The fertilized eggs from oviduct move forward and receive vitelline secretion from yolk gland containing yolk cells.

L.H. LIVER FLUKE (FASCIOLA HEPATICA)



secretory tubules

- Each fertilized egg is surrounded by several yolk cell which provide yolk and shell material.
- The yolk cell contain numerous large *shell globules* made of protein and phenol.
- The phenol is oxidized in the proximal part of uterus into quinone,
- Which tans the protein producing a hard resistant and leathery substances known as sclerotin.
- *This sclerotin forms the shell around the fertilized egg.*

Segmentation:

- Segmentation begins when the eggs are inside the uterus.
- The first cleavage is complete but unequal producing a small granular propagatory cell and a large somatic or ectodermal cell.
- The propagatory cell divides and form progonic cells and somatic cells.

- These siomatic cells after division form the body structure of the larva.
- While the propagative cells remain as germ cells.
- The fully formed ciliated miracidium larva hatched out of the eggs by forcing off the operculum within 9 to 12 days.

Miracidium Larva:

- They are free living develops in 9 to 15 days under optimum temperature of 22°C to 25°C.
- The larva secretes a proteolytic enzyme which helps in the erosion of the lower surface of the operculum which is forced open by larva.
- The miracidium larva possesses the following structures:
 - 1) The larva is minute in size and conical in form with covering of cilia
 - 2) At the anterior broad end is a triangular boring papilla which is protrusible.
 - 3) Behind the papilla, is a nerve ganglion with two eye-spot embedded in it.
 - 4) A pair of flame cell or protonephridia are present and they open outside by two apertures.
 - 5) Inside is filled up with parenchyma with few germ cell which gives rise to new individuals at a later stage.

6) The miracidium larva possesses well developed locomotory organs, sense organs, body cavity and cellular epidermis. In these respects it is more advanced than the adult worm.

Infection to the Secondary Host(Amphibial Land Snail):

- The Miracidium larva swim actively in water and moves on damp harbages with cilia and can survive only if it comes in contact with the intermediate host, Limnaea truncatula , approximately within 8 hours otherwise it dies.
- It pierces into the tissue of the snail with papilla and reaches the root of respiratory chamber.
- Changes takes place in its organisation:
 - i. Cilia cast off
 - ii. The eyes, ganglia and excretory organ DEGENERATED
 - iii. The larva losses its conical form, develops a cavity inside and become an enlarged sac. This stage develops into a sporocyst larva.

Sporocyst Larva:

- The elongated sac-like sporocyst larva possesses the following structure.
 - 1) Its wall is formed by a single layer of cell
 - 2) Below the cuticle is a layer of circular and longitudinal muscle.
 - 3) The flame cells and remnant of eye-spots are present
 - 4) The internal cavity contain germs cells.
 - 5) The germ cells are budded off from the internal lining of the cavity and behave like parthenogenetic ova.
 - 6) Each cell divides to produce blastula, gastrula and finally a form of larva known as *Redia* but may produce daughter sporocyst.

Radia Larva :

- 1) Five to eight elongated and cylindrical sac-like rediea are produced by rupture of each sporocyst
- 2) The cylindrical body with pair of short processes near the posterior end helping in movement.

- 3) A simple alimentary canal with a muscular pharynx and a sack-like intestine is present
- 4) Numerous unicellular pharyngeal glands open into the pharynx.
- 5) A system of excretory vessels are present
- 6) The flame cells divide and re-divide forming anterior and posterior branches of excretory tubules.
- 7) The body of the larva is filled with delicate parenchyma which is packed with group of germ cell or germinal cells.
- 8) The germ cells are present inside the body and these may produce a second generation of daughter radia.
- 9) Fully formed Radia come out from sporocysts by rupture of body wall and migrate to the liver of the snail and feed the tissue of this organ.
- 10) From the germ cells of each radia new type of larva is produced known as cercaria which are 14 to 20 in number. Cercaria are produced in summer, but in winter, the radia produced daughter radia.
- 11) The cercaria escapes from the radia through an opening known as birth pore

Cercaria Larva:

A fully formed cercaria larva possesses the following structures:

- 1) The body is flattened, oval heart-shaped with a long contractile tail.
- 2) The anterior and posterior suckers, the mouth, muscular pharynx, oesophagus and bifid intestine are present.
- 3) There are numerous flame cells and the excretory ducts unite to form the excretory bladder.
- 4) The presence of gonads and the number of unicellular cytogenous glands are situated below the large body wall.
- 5) Their secretion forms the cyst around the larva when it is converted into metacercaria.
- 6) The cercaria takes its way out of the snail through the birthpore of the radia and loses its tail, becomes encysted and remains attached to blades of some aquatic weed like grass or other harbages.

Metacercaria larva:

- It is an encysted cercaria which is somewhat rounded with a thick outer covering of cuticle in the form of a cyst.
- The gland cells of the cercaria disappear in it and the flame cells increase in number.

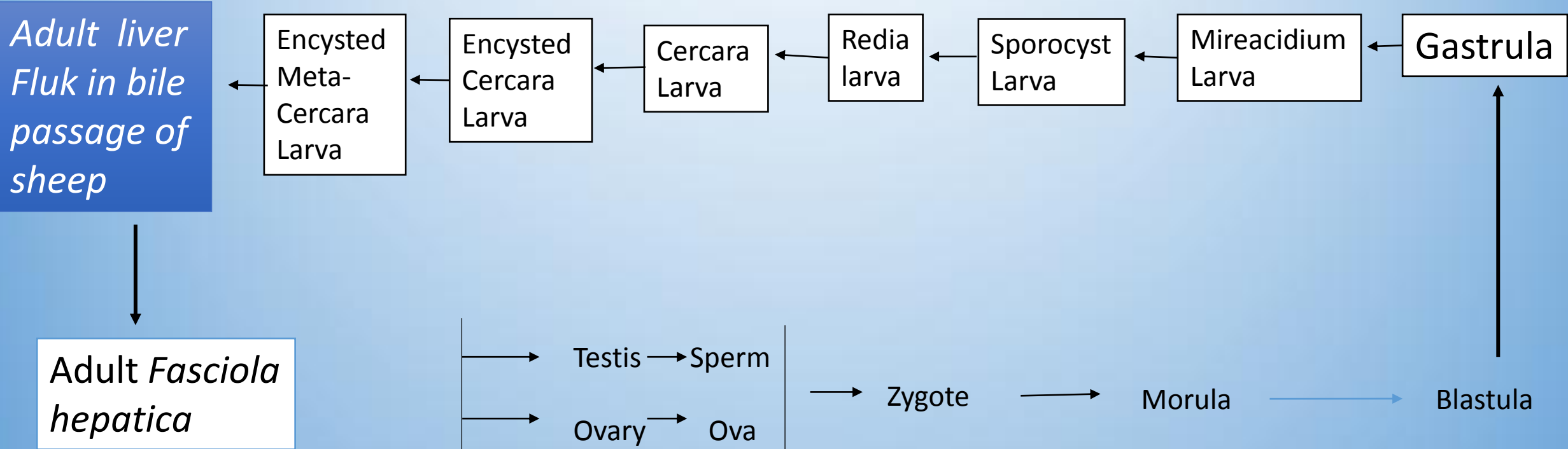
Infection to the Final Host(Sheep):

- The encysted cercaria or metacercaria when taken by the definitive host or final host i.e. sheep with grass during grazing in the field and reaches the intestine.
- In the intestine, the cyst wall is dissolved by the liver through the hepatic portal system to bile duct and reaches the adult stage.

Transmission:

- The mode of transmission of larva from one host to the other is known as transmission.
- The encysted cercaria larva when eaten up by the definitive host sheep, along with blades of grass and passes in the intestine of sheep
- The young fluke emerges from the metacercaria in the gut and migrates to the bile duct where it grows rapidly

Life Cycle of *Fasciola hepatica* is summarized below in schematic form:



Alternation of Generation:

- **Liver fluke takes two host to complete life cycle.**
- **The sexual generation of it is passed in the bile duct of sheep and the embryonic stages like miracidium, sporocyst, redia, and cercaria are found in the intermediate host i.e. in amphibian land snail.**