

B.Sc. 1<sup>st</sup> semester  
Zoology(Honours)  
Course Code: ZC101T

**Unit 5: Platyhelminthes, General Characteristics and classification upto  
classes**

**Life cycle and pathogenicity of Fasciola hepatica**

*Name of the Teacher:-  
Dr. Merina Narah  
Assistant Professor  
Deptt. of Zoology  
Silapathar College, Silapathar*

## General characters of Platyhelminthes

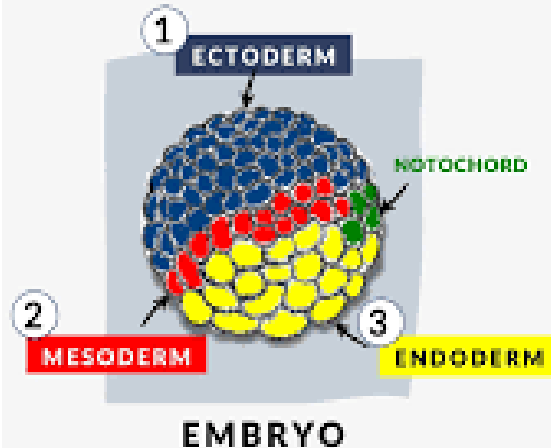
- ❖ Platyhelminthes are bilaterally symmetrical and dorsoventrally flattened, triploblastic worms.
- ❖ Body shape generally worm-like but varies from moderately elongated flattened shape to long flat ribbons and leaf-like.
- ❖ Majority of flat worms are white, colourless, some derive colour from the ingested food while the free living forms are brown, grey, black or brilliantly coloured.
- ❖ Anterior end of body is differentiated into so called head.
- ❖ Presence of great variety of adhesive secretions, organs of attachment and adhesion.
- ❖ Acoelomate i.e. true coelom is absent.
- ❖ Body space between the various organs is filled with a mesenchyme usually called parenchyma.
- ❖ Respiratory and circulatory system is absent.
- ❖ Excretory system consists of a single or paired protonephridia with flame cells or bulbs
- ❖ Nervous system is primitive.
- ❖ Reproduction – both sexual and asexual sometimes hermaphrodite.

## Bilateral Symmetry

when the body plan can be divided along a plane that splits the animal's body into right and left sides that are mirror images of each other



## Triploblastic



Triploblastic animals develop three germ layers during the embryonic stage:

- Ectoderm
- Mesoderm
- Endoderm

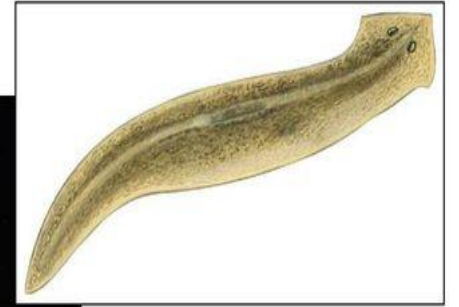
Examples: Flatworms, Annelids, Arthropods, Mollusks, Echinoderms, and Chordates



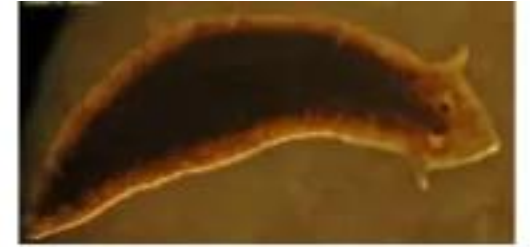
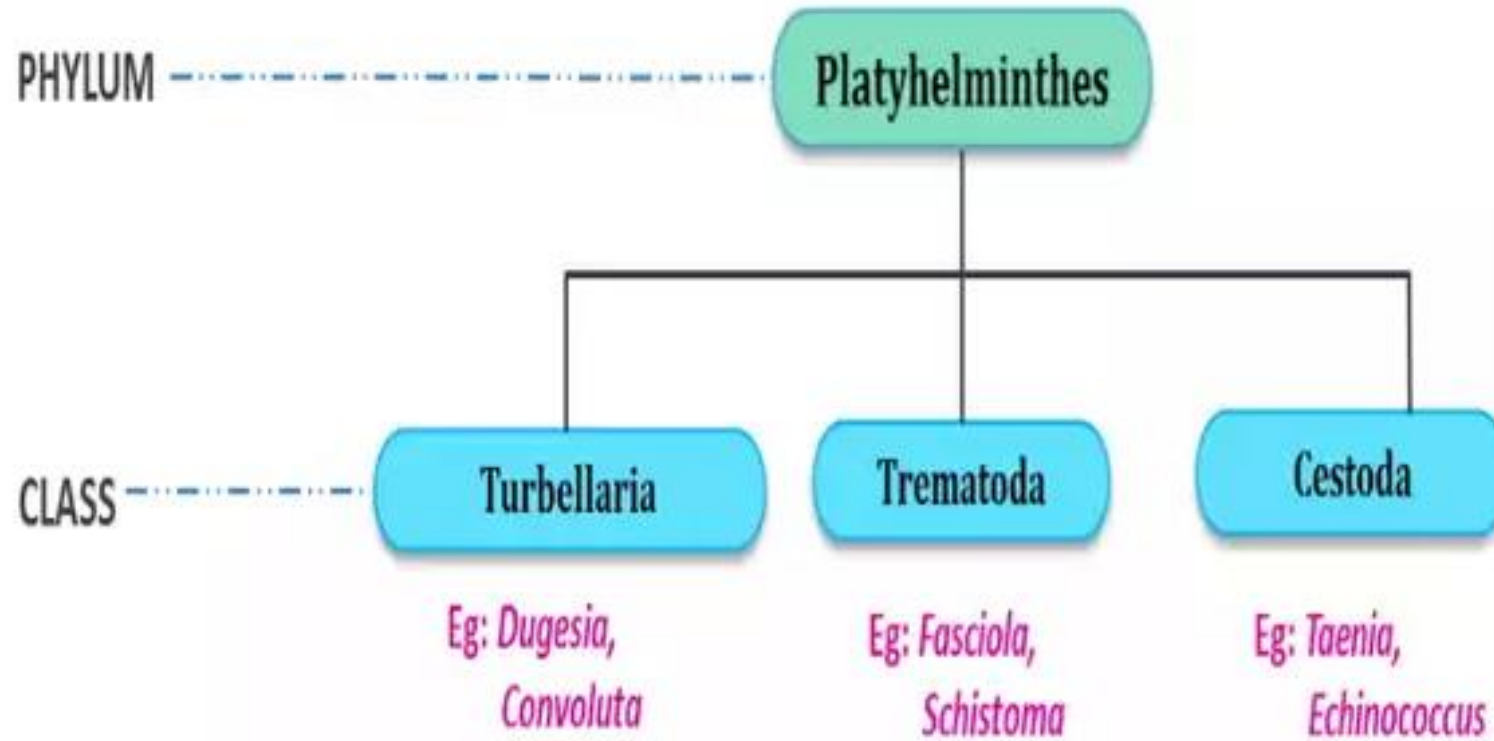
## Phylum Platyhelminthes - Flatworms

### Examples:

- Tapeworms
- Planeria
- Parasitic Flukes



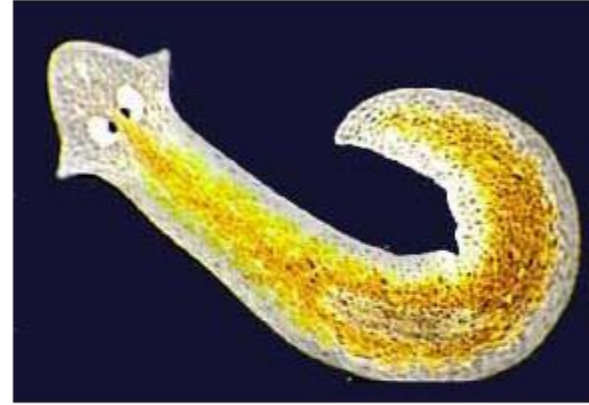
# Classification of Platyhelminthes: Three Classes



- **Class: Turbellaria**

- Planarians

- Free-living, scavengers
- Live in ponds, lakes, moist areas etc.
- Harmless; part of the food chain
- Hermaphrodites
- No blood, few organs
- Oxygen diffuses into cells directly from water



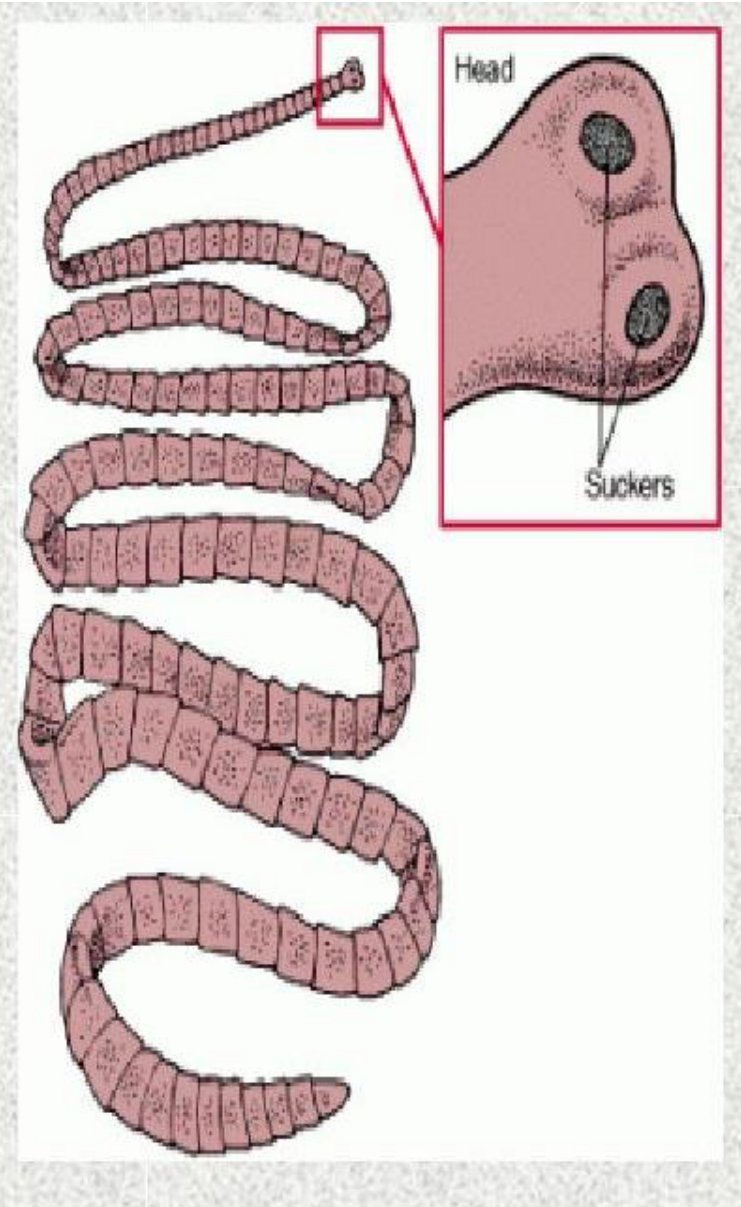
# Class Trematoda (Flukes)

- Flatworms of the class Trematoda are known as flukes.
- They are all parasitic and may be very damaging to their hosts.
- The Asian liver fluke is very common in many parts of Asia and is responsible for a great deal of sickness, disability and death.
- People become infected by eating raw or improperly cooked meat carrying these fluke larvae.



# Class- Cestoda

- A. They have a flattened and segmented body.
- B. Each segment is called a proglottid and contains a set of reproductive organs. A chain of proglottids is called a strobila. Proglottids originate in an area called the germanitive zone which is behind the head.



# Liver fluke

## Scientific Classification

*Fasciola hepatica*

Phylum- Platyhelminthes

Class- Trematoda

Order- Digenea

Genus- *Fasciola*

Species- *Fasciola hepatica*

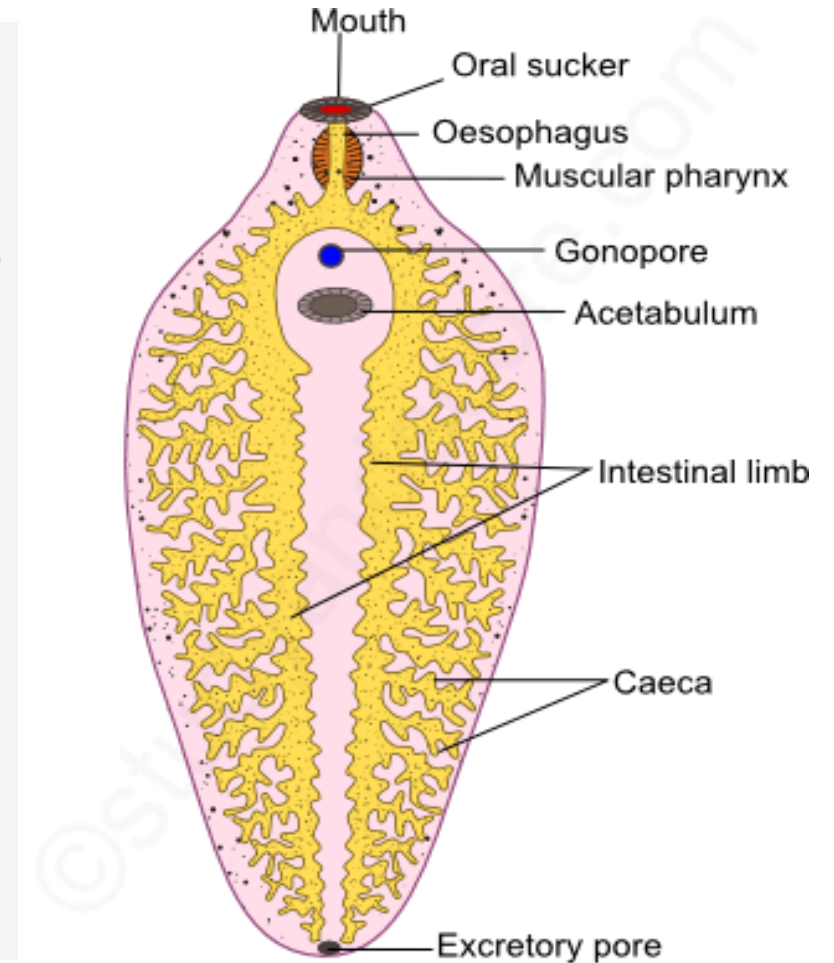
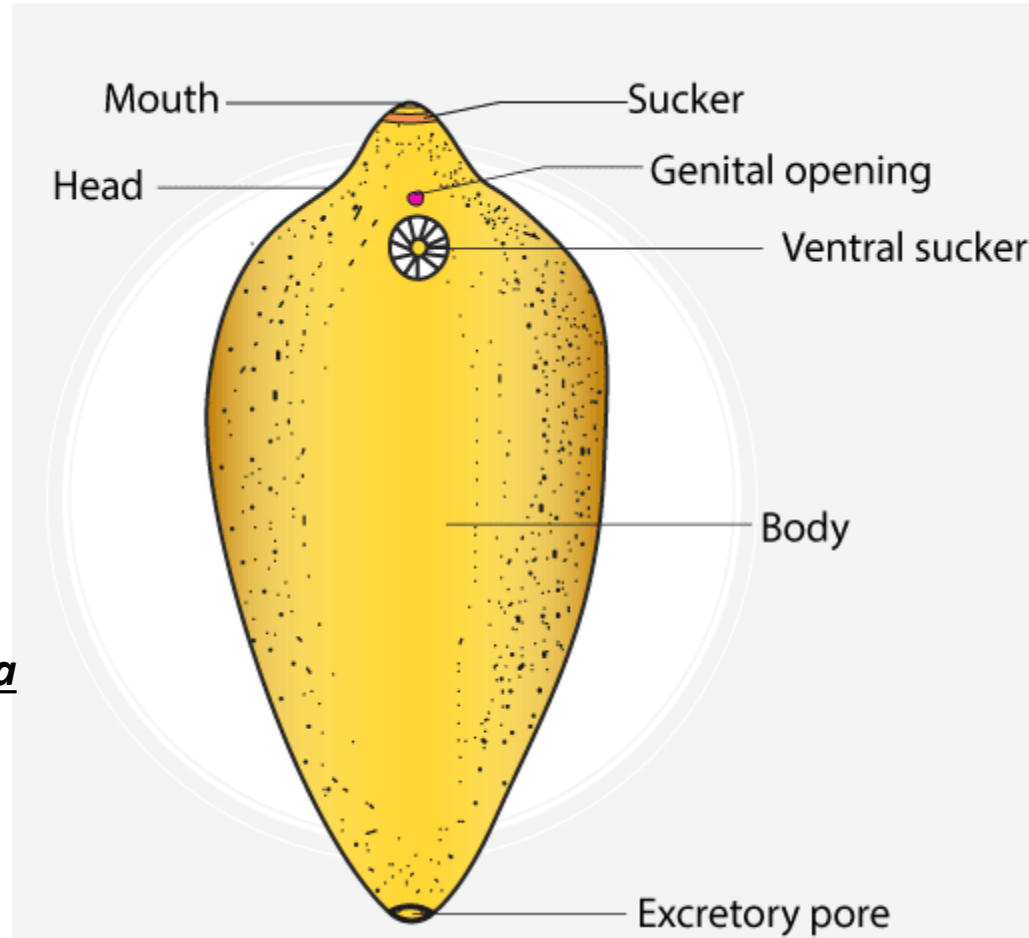


Fig. External view of *Fasciola hepatica*



*Fasciola hepatica* is also known as common liver fluke or sheep liver fluke.

The disease caused by the fluke is known as fascioliasis

Definitive host (Primary host)-

Sheep, cattle, Humans, Other Mammals

Intermediate host (secondary host)- Freshwater Snail.

Morphology-

Flat leaf like body

20-30 mm long

8-15 mm wide

# Larval stages of *Fasciola hepatica*

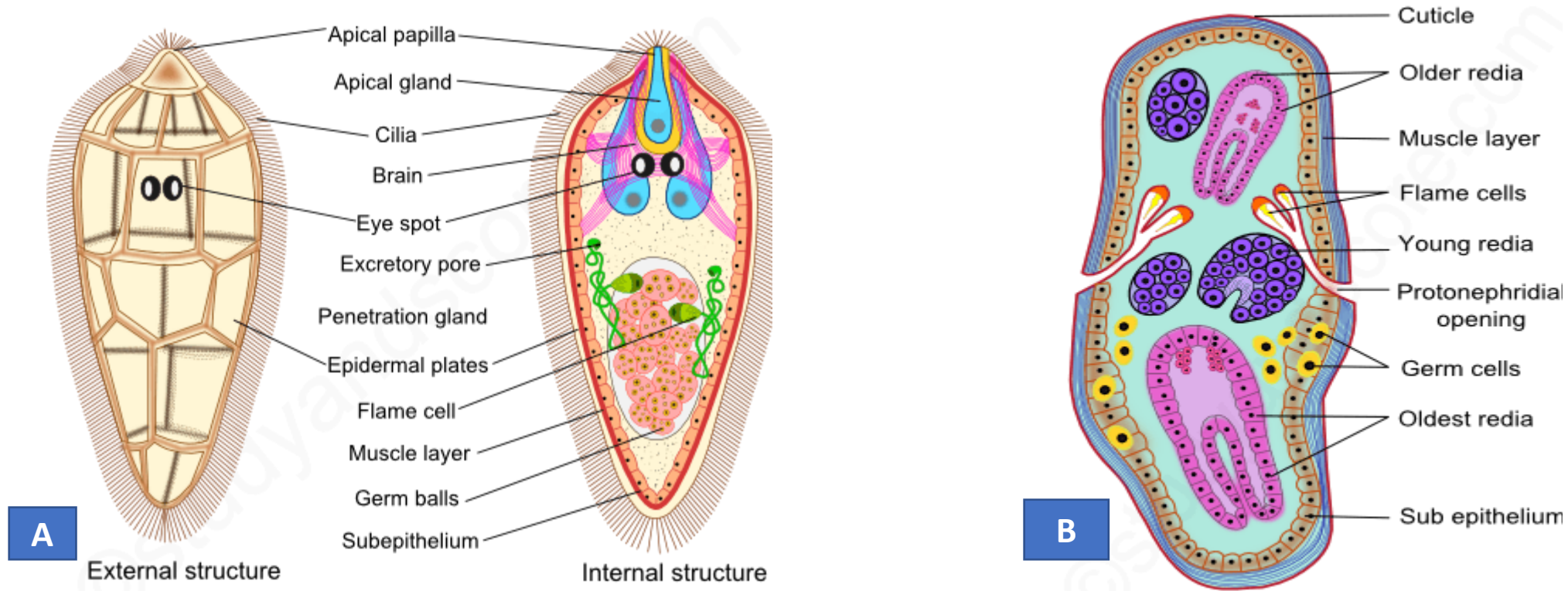


Fig: Larval stages of *Fasciola hepatica* A) Miracidium larva B) Sporocyst

## A) Miracidium larva

Miracidium larva is the first larval stage which is free swimming and penetrates a freshwater or marine snail.

It is minute, oval and elongated, free-swimming stage, it is covered with 18 to 21 flat ciliated epidermal cells lying in five rings.

The first ring is made up of six plates, second ring has six plates, third ring has three plates, fourth ring has four plates and fifth ring has two plates.

Anteriorly it has a conical apical papilla, and attached to it is a glandular sac with an opening called apical gland.

There are two pigmented X-shaped eye spots and a nervous system.

There is a pair of protonephridia, each with two flame cells.

Towards the posterior side are some propagatory cells.

The miracidium does not feed, it swims about in water or moist film, but it dies in eight hours unless it can reach a suitable intermediate host.

## B) Sporocyst

The sporocyst is an elongated germinal sac about 0.7 mm long and covered with a thin cuticle.

The glands, nerve tissue, apical papilla and eye spots of miracidium disappear.

The hollow interior sporocyst has a pair of protonephridia each with two flame cells it has germ cells and germ balls.

The sporocyst moves about in the host tissues and its germ cells develop into a third type of larva called redia larva.

A sporocyst forms 5 to 8 rediae.

The rediae larvae pass out of the sporocyst by rupture of its body wall into the snail tissues with the aid of the muscular collar and ventral processes, then the rediae migrate to the liver of the snail.

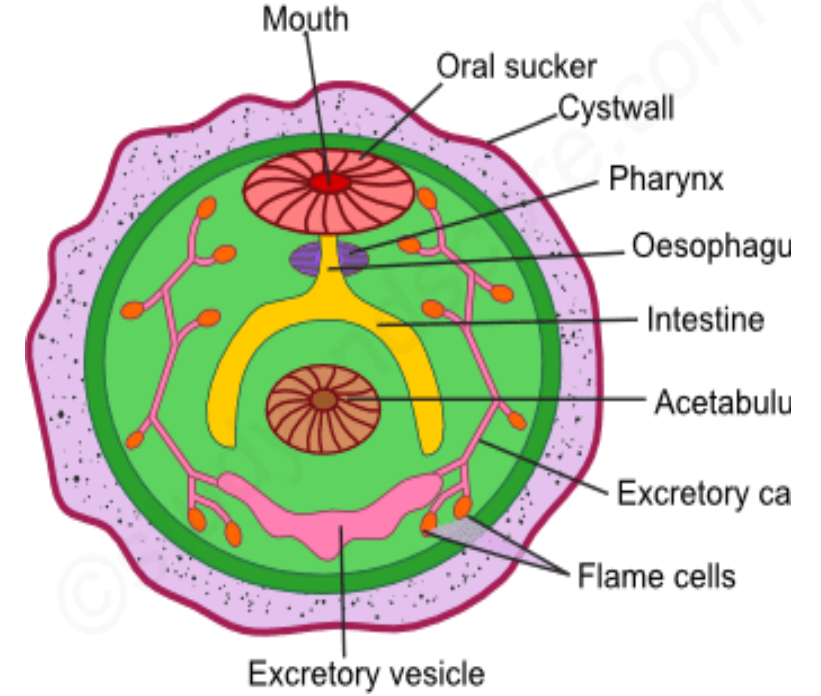
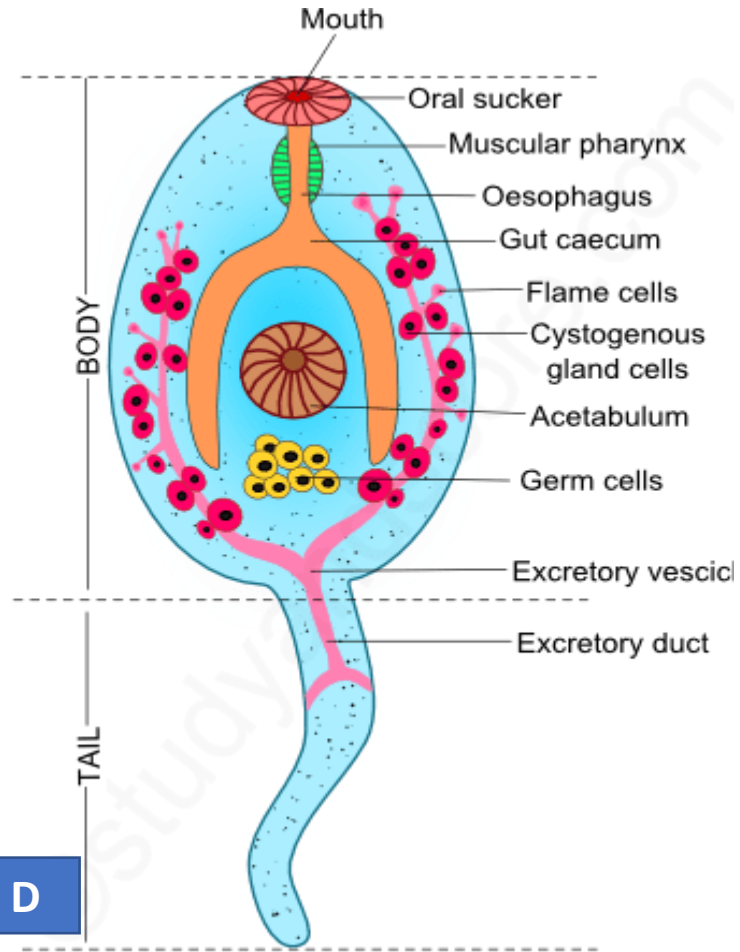
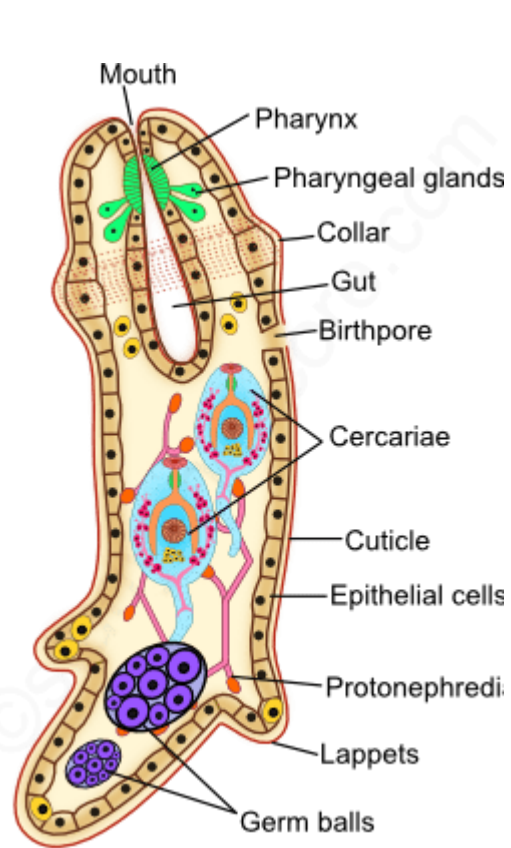


Fig: Larval stages of *Fasciola hepatica* C) Redia D) Cercaria and E) Metacercaria

## C) Redia

The redia is elongated about 1.3 mm to 1.6 mm in length with two ventral processes called lappets or procruscula near the posterior end and birth pore near the anterior end.

Body wall has cuticle, mesenchyme and muscles.

Redia has an anterior mouth, pharynx in which numerous pharyngeal glands open, sac-like intestine and there is a pair of protonephridia with two pairs of flame cells.

Each redia forms about 14 to 20 cercariae.

## D) Cercaria

The cercaria has an oval body about 0.25 mm to 0.35 mm long and a simple tail.

Its epidermis is soon shed and replaced by cuticle, below the cuticle are muscles and cytogenous glands.

There is an excretory bladder with a pair of protonephridial canals with a number of flame cells.

The cercaria escape from the birth pore of the redia, then migrate from the digestive gland of the snail into the pulmonary sac from where they pass out into the surrounding water.

The time taken in snail from the entry of miracidia to the exit of cercaria is five to six weeks.

## E) Metacercaria

The cercaria swim about in water for 2 to 3 days.

Then they lose their tails and get enclosed in a cyst secreted by cytogenous glands.

The encysted cercaria is called metacercaria, which is about 0.2 mm in diameter and it is in fact a juvenile fluke.

If the metacercaria are formed in water they can live for a year, but if they are formed on grass or vegetation then they survive only for a few weeks.

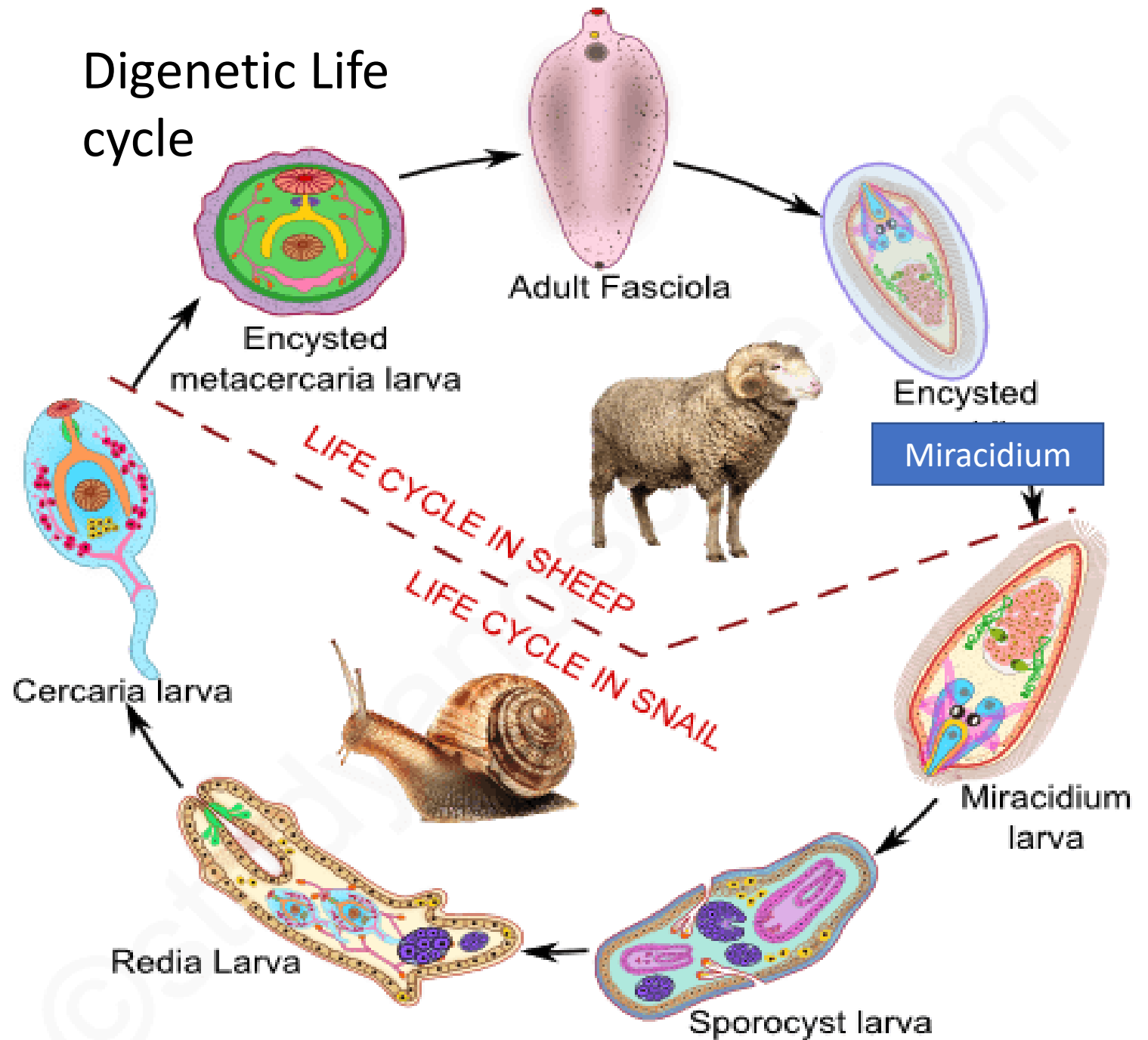
The various larval stages are all formed in the same way from germ cells which are set aside at the first division.



## Life cycle developmental stages

- Copulation
- Development of Zygote
- Formation of Miracidium larva
- **Infection of secondary host**
- Sporocyst larva
- Redia larva
- Cercaria larva
- Metacercaria larva
- **Infection of Primary host**

Fig: Life cycle in sheep (primary host) and life cycle in snail (intermediate host).



Life cycle of *Fasciola hepatica* can be summarised as follows-

Adult flukes in liver-copulation and fertilisation-laying of capsules in the bile ducts-capsules in the intestine (Stages in sheep's body)- capsules out in faeces-miracidia escape from capsules-miracidia-sporocysts- rediae- cercariae (Stages in snail's body)- metacercariae- metacercariae young flukes-adult flukes(stages in a fresh sheep's body)

## Liver rot disease

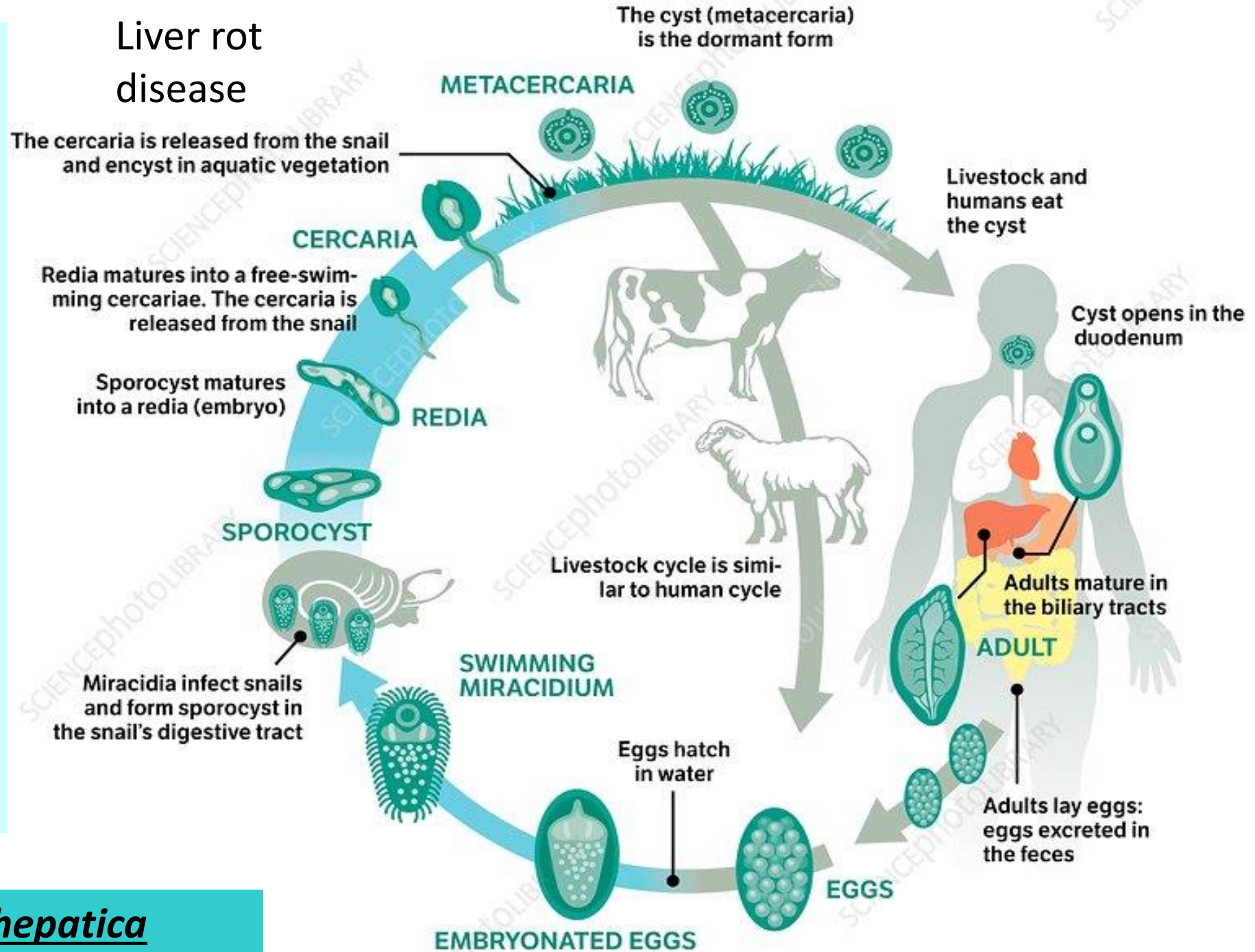


Fig: Life cycle of *Fasciola hepatica*

## Pathogenicity:

**Pathogenicity can be defined as the capacity of a microbe to cause damage in a host.**

### Pathogenicity of *Fasciola hepatica*

- **Fascioliasis** occurs in many areas of the world and usually is caused by *F. hepatica*, which is a common liver fluke of sheep and cattle.
- In general, fascioliasis is more common and widespread in animals than in people.
- The infection in the invertebrate host results in the partial or complete destruction of the effected site. Heavy infection result in the increase of the snail.
- The infection in the primary host cause damaged in the bile duct and the liver.
- In the bile ducts it causes inflammation resulting in the loss of epithelium and gall stones. The normal metabolism of the liver is affected by heavy infection. The infection in the Sheep is called as liver rot or Fascioliasis.

## The symptoms of the liver rot include:

- ❖ Decline in appetite
- ❖ Anemia
- ❖ Irregular rumination
- ❖ Fever
- ❖ Increase in respiratory activity
- ❖ Conjunctiva becomes whitish yellow
- ❖ Wool becomes dry, brittle and finally falls off
- ❖ Finally it leads to the death of the infected host.

## Prevention:

The control of the vector is the best method to prevent the disease. Other preventive measures include the following:-

- Separation and killing of heavily infected sheep
- Destroying manure and eggs of infected sheep
- Feeding infected sheep with salt and little dry food.
- Killing infected snail population by adding Copper Sulphate solution in ponds and ditches.

## **Treatment of the disease- Fascioliasis**

Anthelmintic drugs namely hexachloroethane, Carbon tetrachloride, Ficin, Emetine hydrochloride, Phenothiazine and Tetrachloroethane are used for the treatment of the liver rot cases. These drugs are effective in killing the stages of parasite in liver.