

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

# Parasites 1

## Platyhelminthes

# Medical parasitology is classified

into

**Medical helminthology**

**Medical protozoology**

**Deals with parasitic worms**

**Deals with unicellular parasites**

**1-Phylum :  
Platyhelminthes  
(flat worms)**

**2-Phylum :  
Nemathelminthes  
(round worms)**

➤ **Class: Trematoda**  
➤ **Class: Cestoidea**

➤ **Class: Nematoda**

**1-Class: Rhizopoda:**

(move by pseudopodia)

**2- Class: Ciliata**

(move by cilia)

**3-Class: Zoomastigophora**

(move by flagellae)

**4-Class: Sporozoa**

(move by gliding movement)

# Class Trematoda (flukes) are classified into

1- Liver fluke

*Fasciola*

2- Intestinal flukes

1- *Heterophyes heterophyes*

2- *Fasciolopsis busci*

3- Blood flukes

1- *S. mansoni*

2- *S. haematobium*

3- *S. japonicum*

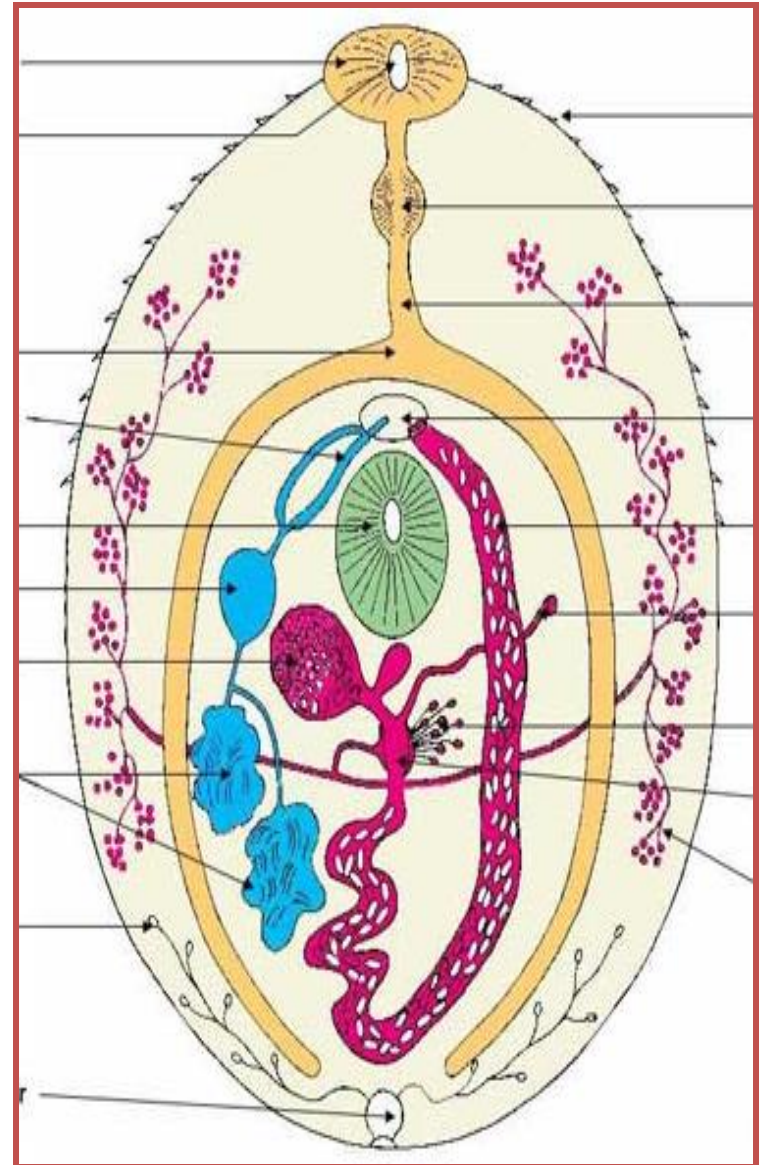
4- Lung fluke

*Paragonimus*

# Class : Trematoda (Flukes)

## ❖ General characters:

- Flattened, leaf-like **except** female of *Schistosoma*.
- Hermaphrodite.
- Bilaterally symmetrical.
- Has no body cavity.
- Variable in size. Large (*Fasciola*), very small (*Heterophyes*).
- Covered with cuticle( smooth, é spine or tubercle).
- **Organs of fixation:**
  - Oral sucker ➔ anterior.
  - Ventral sucker ➔ Larger on the ventral surface.
  - Genital sucker (**present in some species**).



# Digestive system

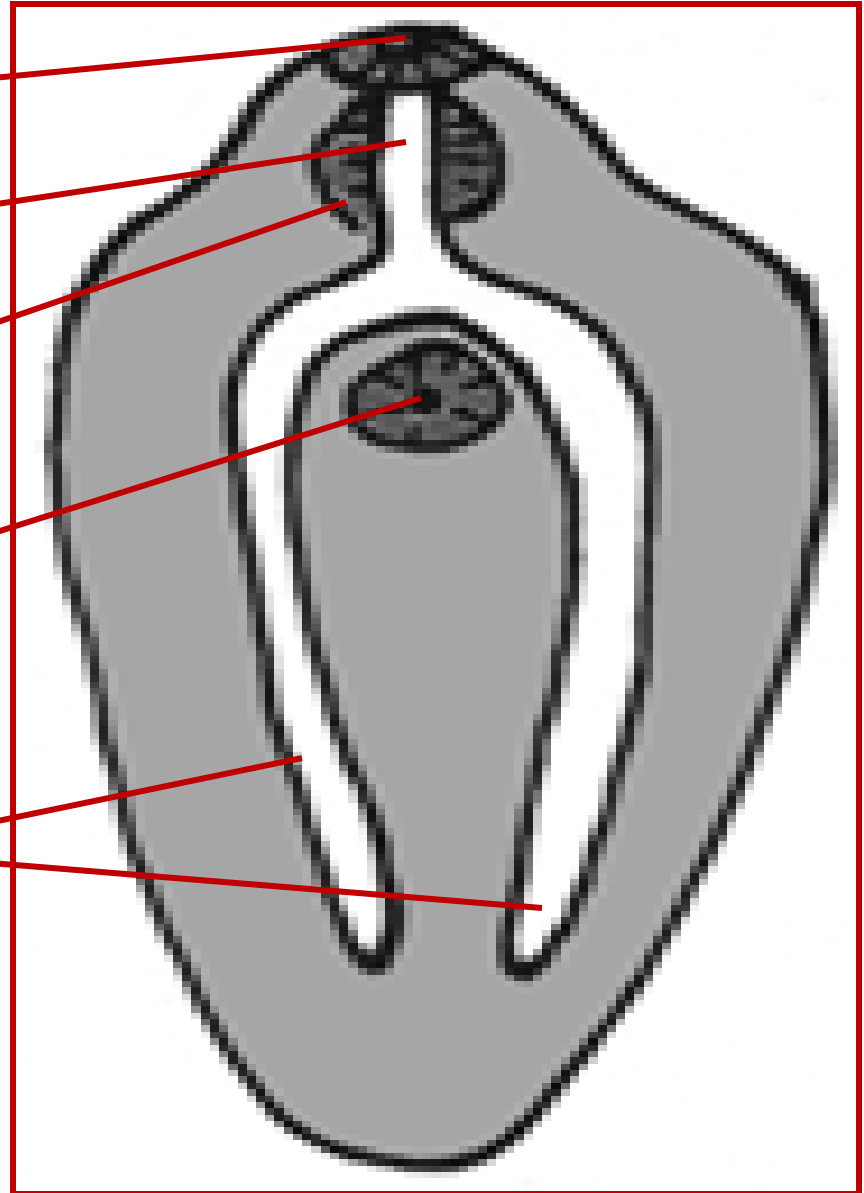
Mouth surrounded by oral sucker

Short oesophagus

Muscular pharynx  
(absent in  
*Schistosoma*)

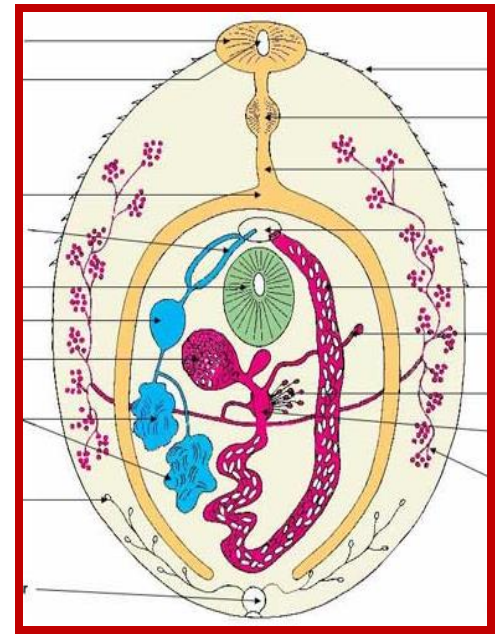
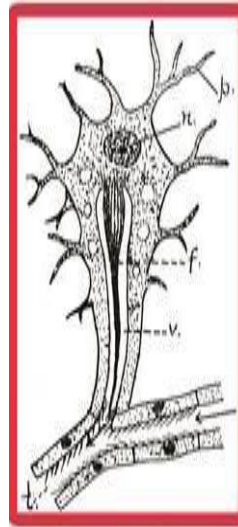
Ventral sucker

2 intestinal caeca end blindly  
may be simple or branched



❖ **Excretory system:**

**Bilaterally symmetrical  
flame cells → collecting tubules  
which collect fluid → bladder  
→ excretory pore posteriorly.**



❖ **Respiration:** Either **aerobic** (e.g. parasites live in blood and tissues) or **anaerobic** (e.g. parasites live in intestinal lumen and bile duct).

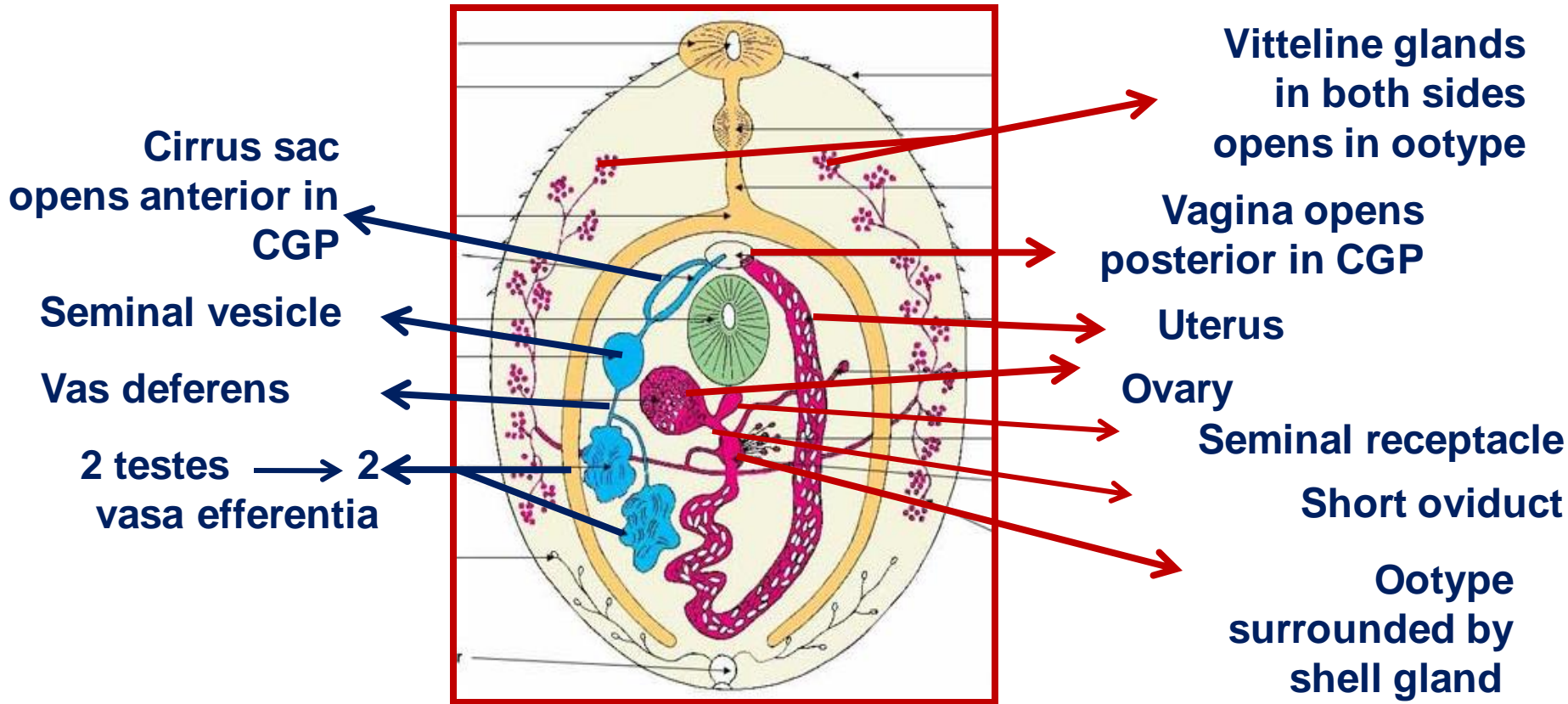
❖ **Nervous system:** The nerve ganglia present around the pharynx and send nerve fibers to different body structures.

# Genital system

All trematods are hermaphrodite except *Schistosoma*

## Male G.System

## Female G.System





❖ **The eggs of trematodes** are operculated (except for schistosomes), usually they **pass mature** with miracidium inside (*Schistosoma* and *Heterophyes*) or **pass immature** (*Fasciola*, *Fasciolopsis* & *Paragonimus*) and all eggs need water to hatch.



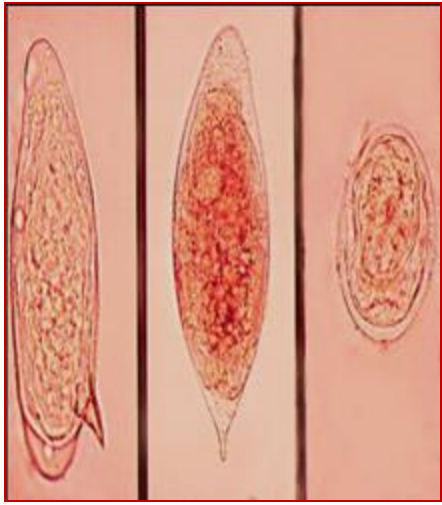
**Paragonimus  
egg**



**Fasciolopsis  
egg**



**Fasciola  
egg**

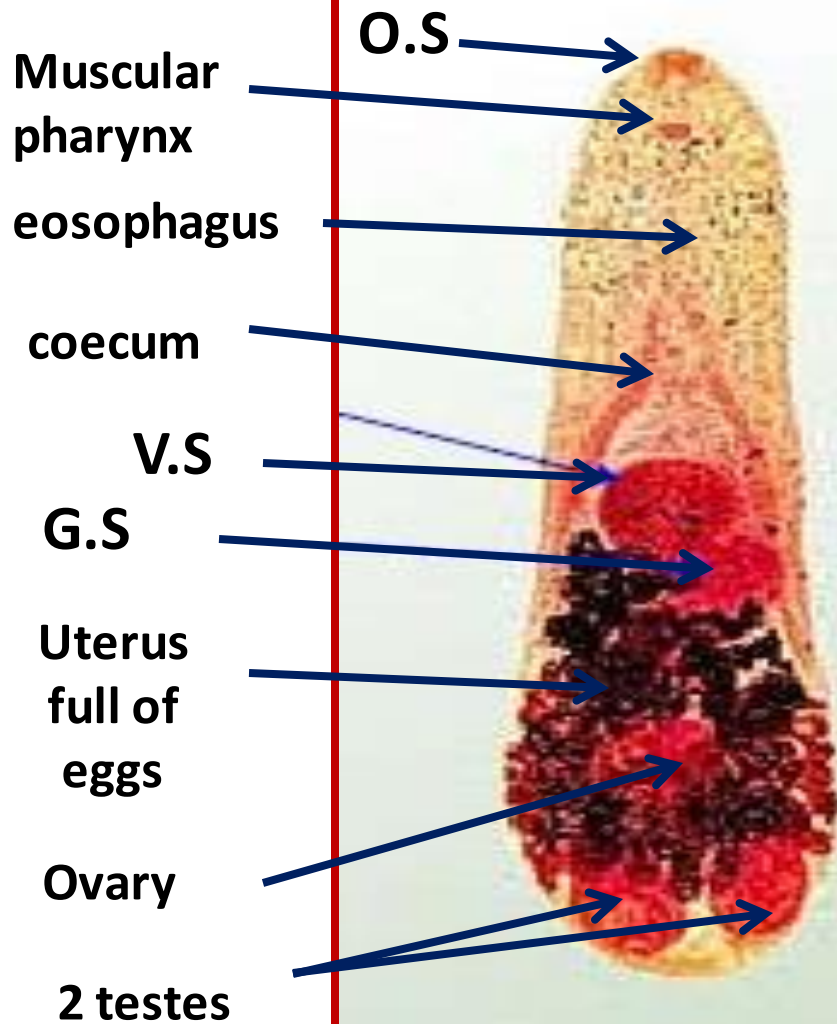


**Schistosomes  
eggs**



**Heterophyes  
egg**

# *Heterophyes heterophyes* Adult



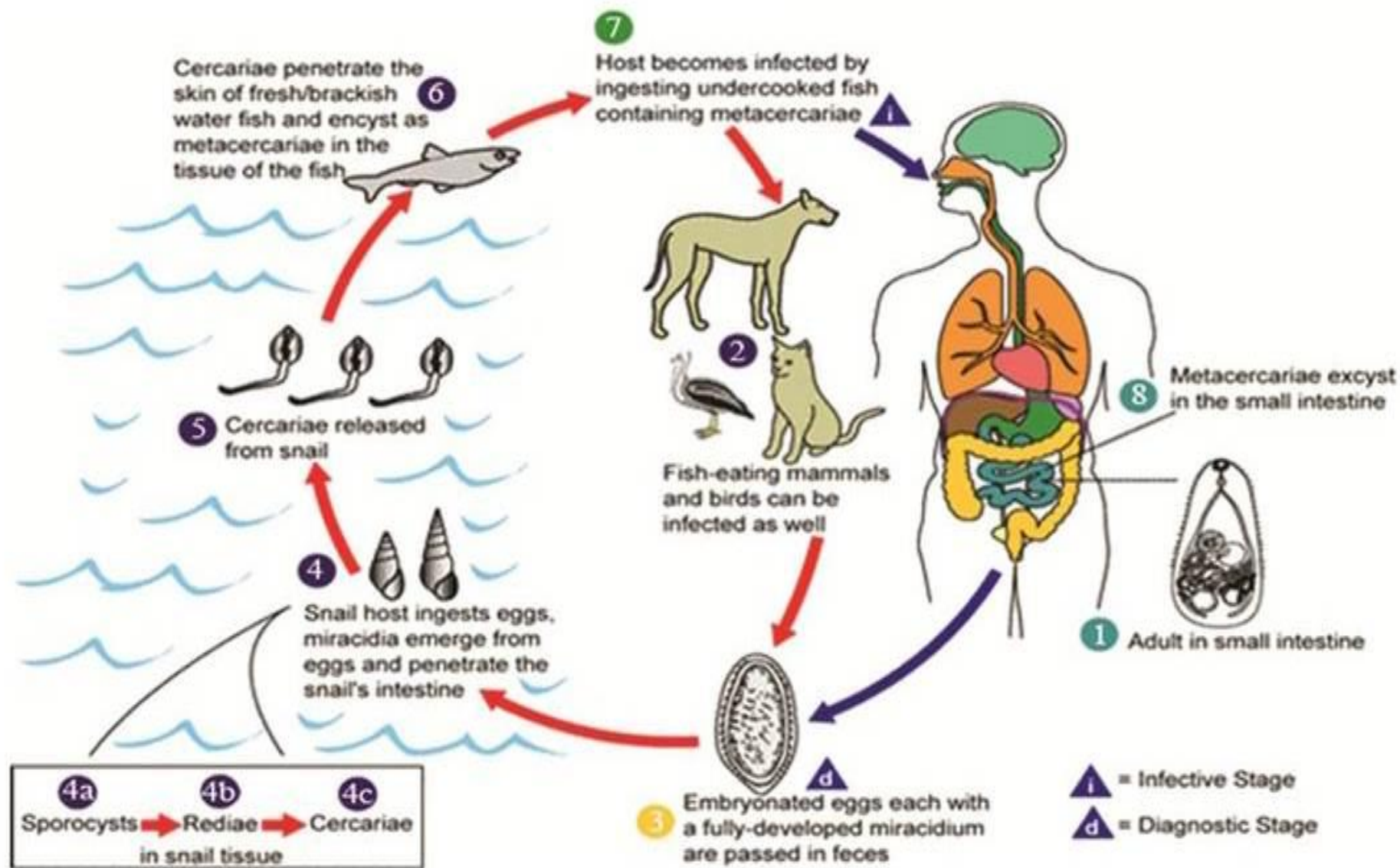


Fig. (3 - 5) *H. heterophyes* life cycle

# *Heterophyes heterophyes* Egg

## ❖ Eggs (D.S) :-

- **Size** : 30 x 15  $\mu\text{m}$ .
- **Shape** : Oval.
- **Shell** : Thick with anterior operculum and a small knob at posterior end.
- **Color** : Yellowish brown.
- **Content** : Mature (miracidium).



# *Pirenella conica* snail

Inside the snail:

Miracidium



Sporocyst



Cercaria



Redia



1<sup>st</sup> I.H  
of *H. heterophyes*

## *H. Heterophyes miracidium*

### ❖ **Miracidium:-**

➤ **Pyriiform ciliated larva.**

➤ **Germinal cells develops**

**into sporocyst.**



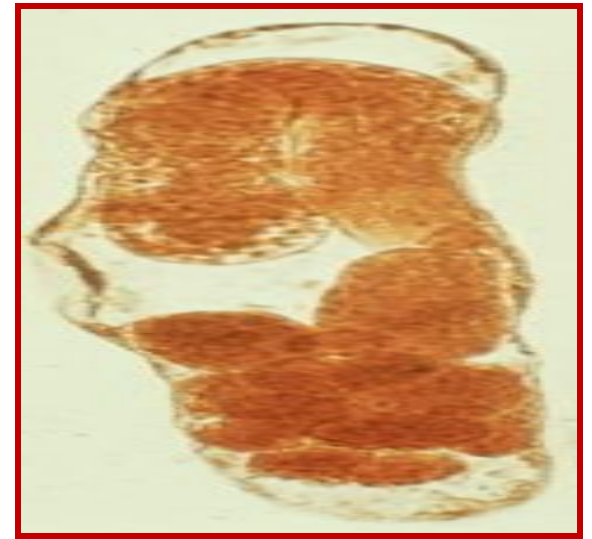
❖ **Sporocyst:-**

Simple elongated sac filled with germ cells. sporocyst develops into rediae.

❖ **Redia:-**

➤ **Cylindrical larva.**

➤ **Germ cells develop into cercariae.**



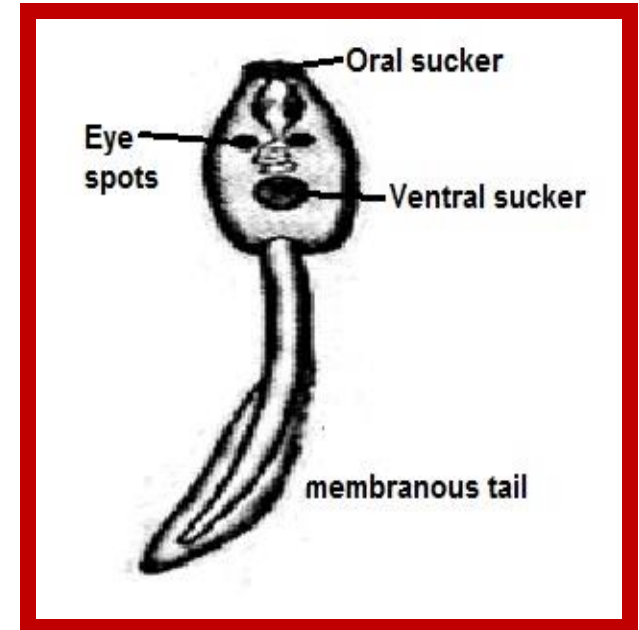
*H. Heterophyes* sporocyst



*H. Heterophyes* Redia

# Lophocercous cercaria of *H. heterophyes*

➤ **Has body and  
membranous tail**



(I.S)  
Encysted metacercaria  
of *H. heterophyes* in  
fish (2<sup>nd</sup> I H)

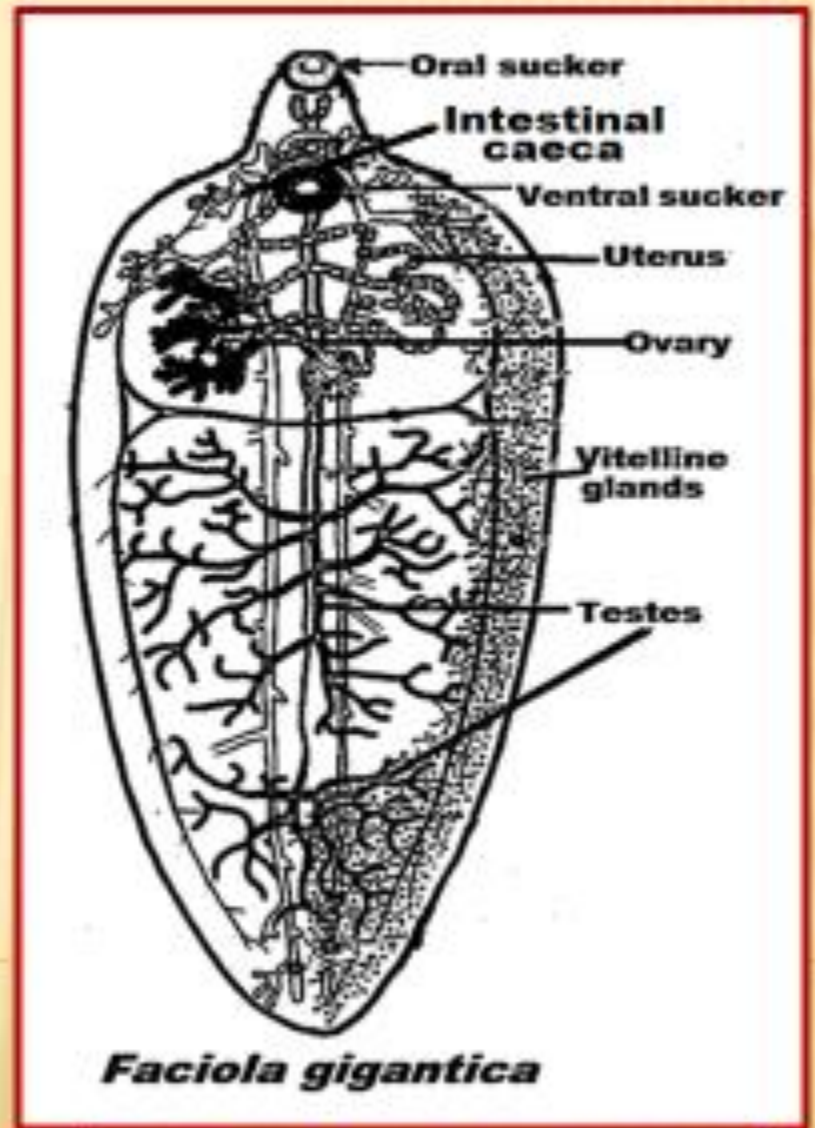




# *Fasciola adult*



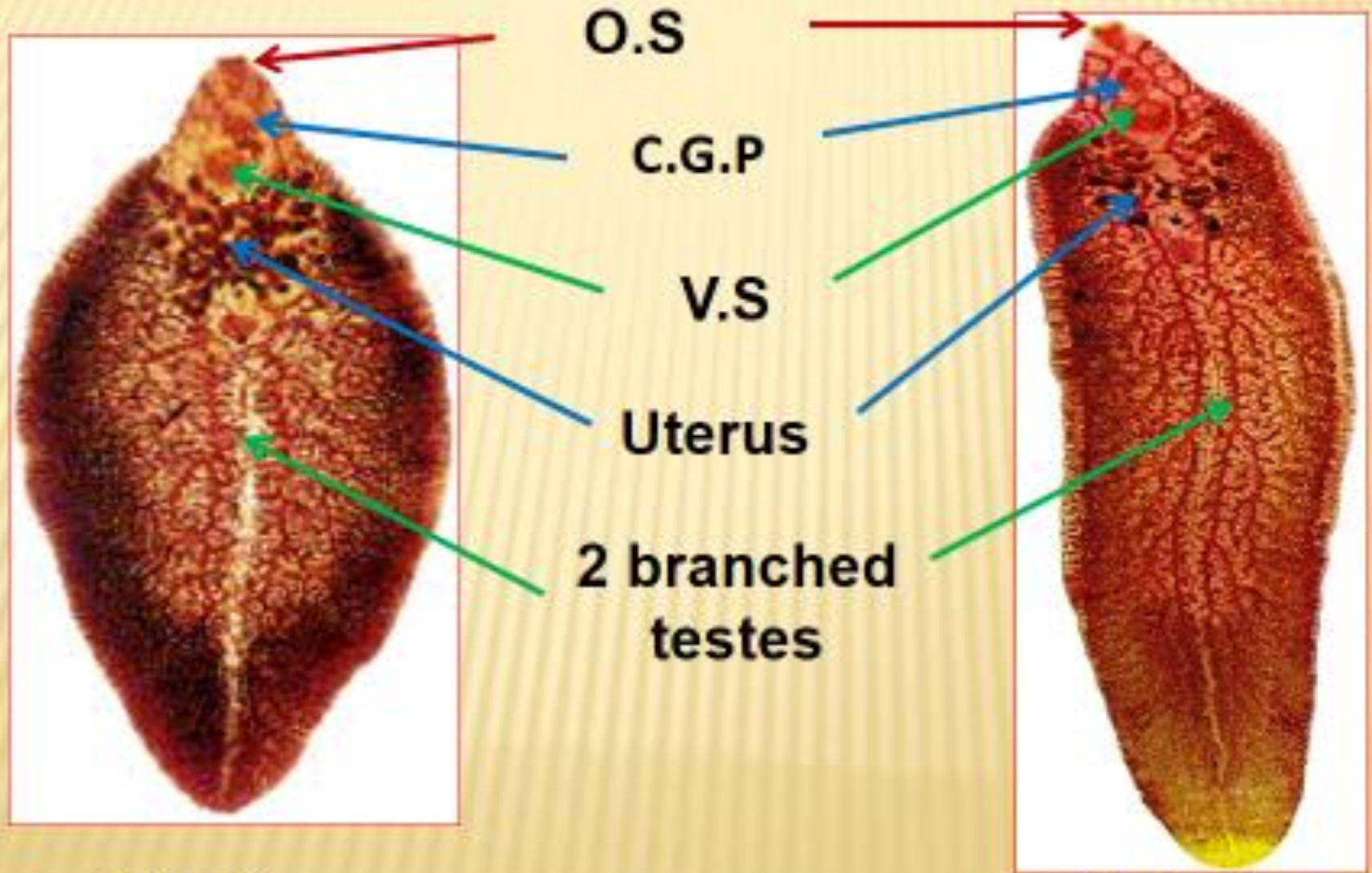
*Fasciola hepatica*



*Fasciola gigantica*

*Fasciola gigantica*

# Fasciola adult



O.S

C.G.P

V.S

Uterus

2 branched  
testes

*F. hepatica*

*F. gigantica*

# Fasciola hepatica

It differs from *F.gigantica* in the following:-

Items	<i>F. gigantica</i>	<i>F. hepatica</i>
Distribution	Africa , Asia	Common in Europe
Reservoir host	Cattle and sheep	Sheep
Size	6 x1.5 cm	3x1 cm
Shape	Longer and slender with small anterior cone and parallel sides	Wide anteriorly and pointed posteriorly (converging) with large anterior cone
Shoulder	Less prominent	More prominent
Suckers	Ventral larger than oral	Equal in size
Testes	In the middle third	Extended to posterior third
Intestinal caeca	Medial branches are Y or T	Medial branches are simple
Intermediate host	<i>Lymnaea cailliaudi</i>	<i>Lymnaea truncatula</i>



## ***Fasciola* egg (D.S)**

- **Size** : 140 x 70  $\mu\text{m}$ .
- **Shape** : Oval.
- **Shell** : Thin operculated.
- **Color** : Yellowish brown.
- **Content** : Immature  
(ovum & yolk cells).



## *Lymnaea cailliaudi* snail

I.H of *Fasciola gigantica*

Inside the snail :

Miracidium → Sporocyst

→ Redia → Cercaria



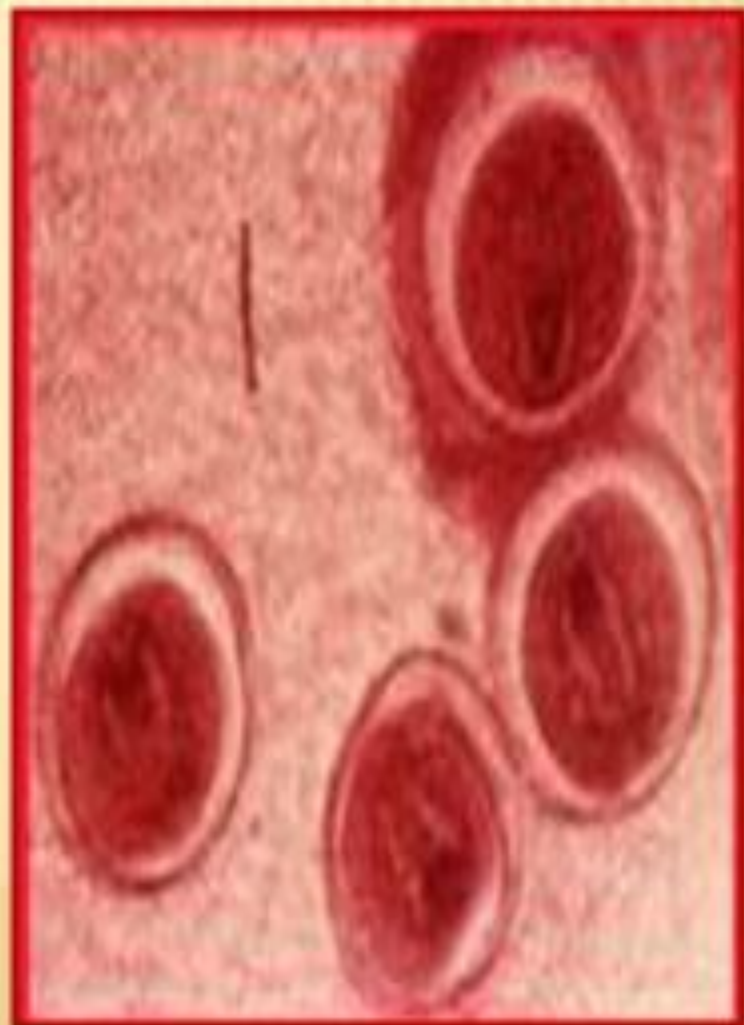
## cercaria of *Fasciola* & *Fasciolopsis*

- Formed of body and tail.
- Body with oral and ventral suckers, simple intestinal caeca.
- Tail : Simple (leptocercous cercaria).

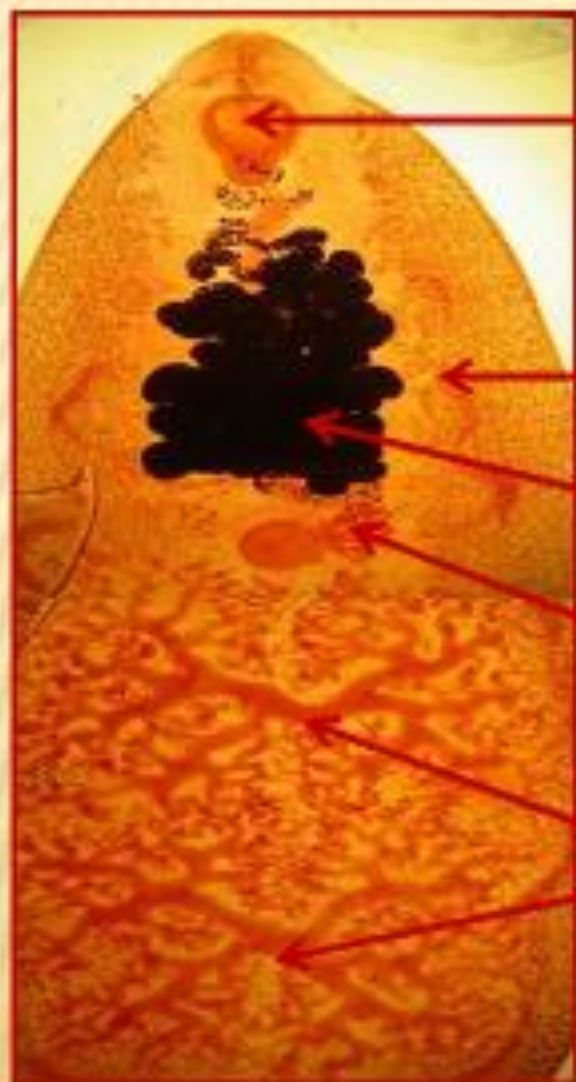


## Encysted metacercaria (I.S) of *Fasciola* & *Fasciolopsis*

- Spherical in shape.
- The cercaria loses its tail and secretes a thick cyst wall.
- Present in green water vegetations and water.



# *Fasciolopsis buski* adult



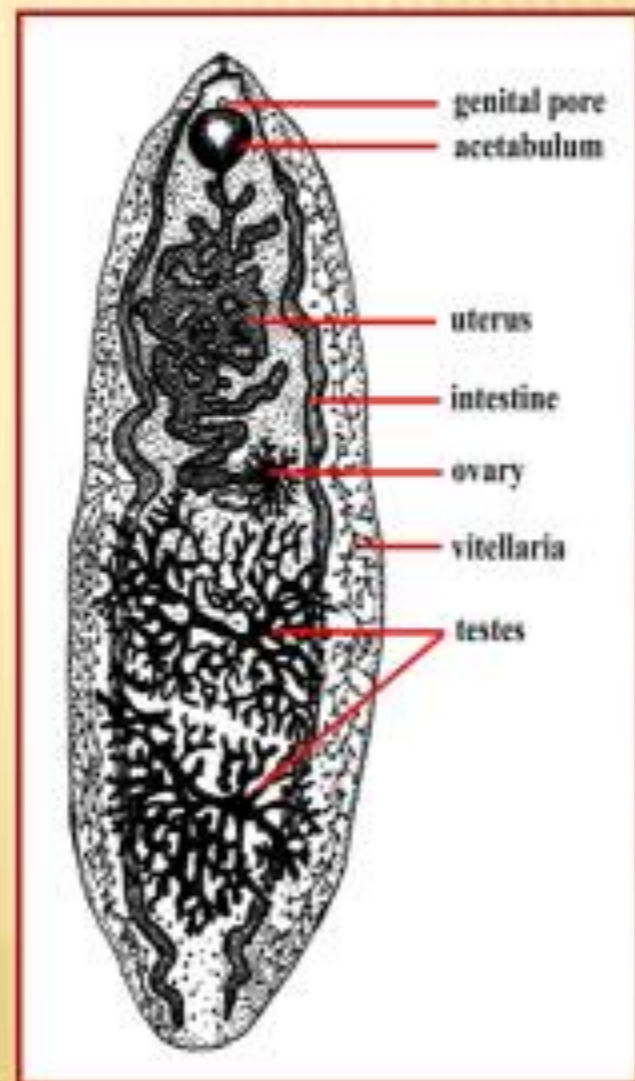
V.S

Simple  
Intestine

Uterus

Ovary

2 testes



genital pore  
acetabulum

uterus

intestine

ovary

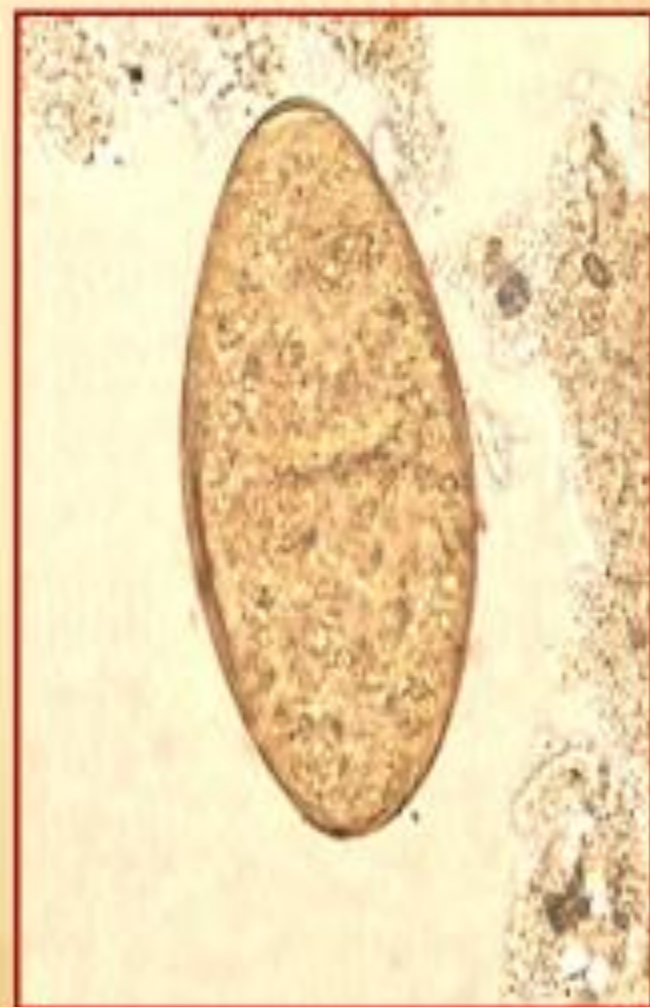
vitellaria

testes



## *Fasciolopsis buski* egg (D.S)

- **Size** : 140 x 70  $\mu\text{m}$ .
- **Shape** : Oval.
- **Shell** : Thin, operculated.
- **Color** : Yellowish brown.
- **Content** : Immature  
(ovum & yolk cells).



## Segmentina snail

❖ I.H of *Fasciolopsis buski*

(miracidium



sporocyst



redia

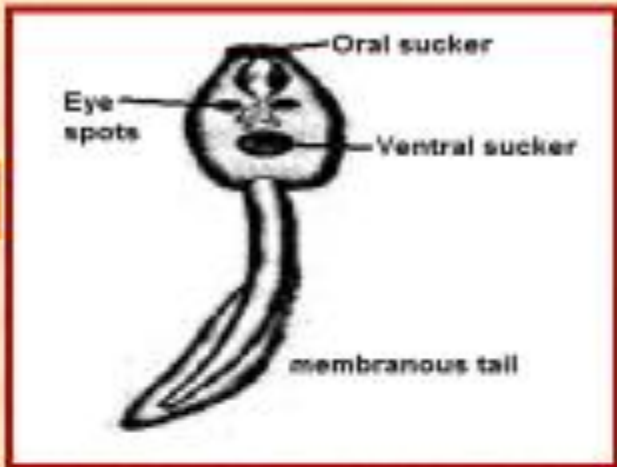


cercaria

(leptoceous cercaria).



# Types of cercaria of Trematodes



*Heterophyes*

*Fasciola & Fasciolopsis*



leptocercous cercaria

Lophocercous cercaria



*Paragonimus*

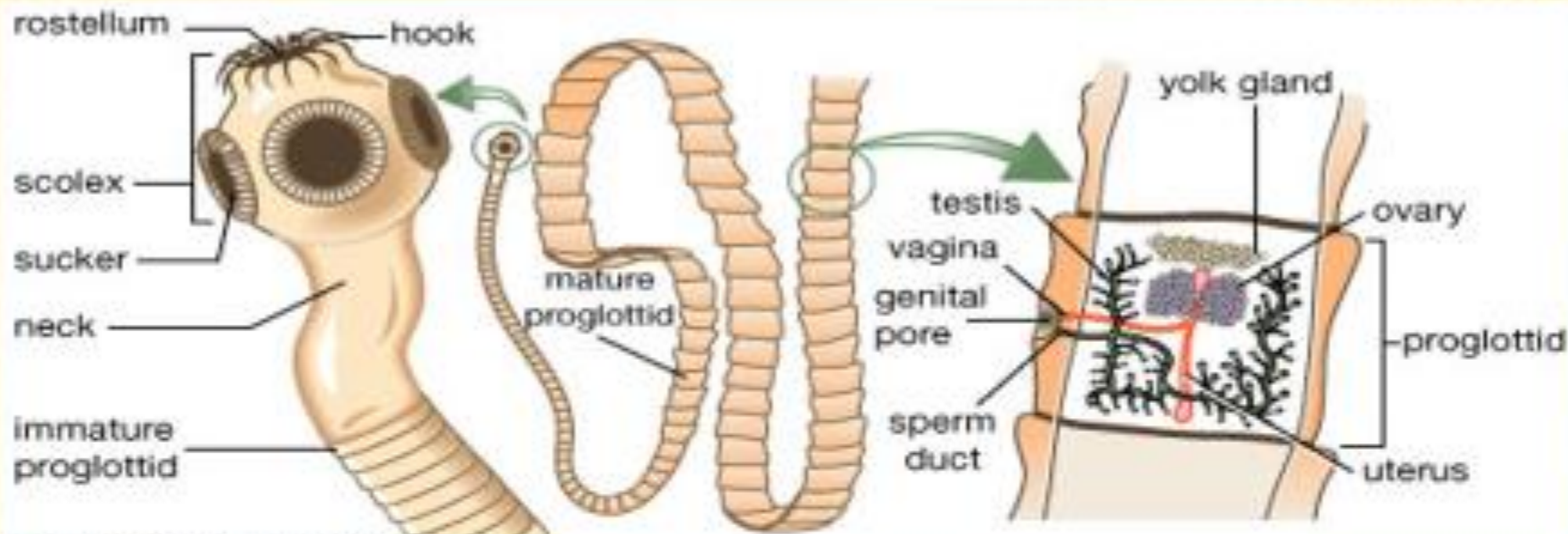
*Schistosoma*



Microcercous cercaria

Furcocercus cercaria

# General characters



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## Adults:

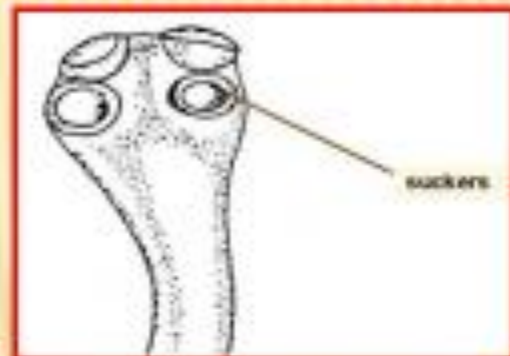
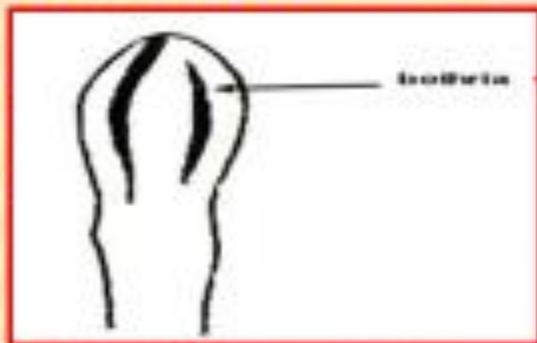
- Flat, ribbon like and segmented.
- Cestodes have **neither a body cavity nor an alimentary tract.**
- Cestodes are **hermaphrodites.**

Subclass Cestoda is divided into two orders

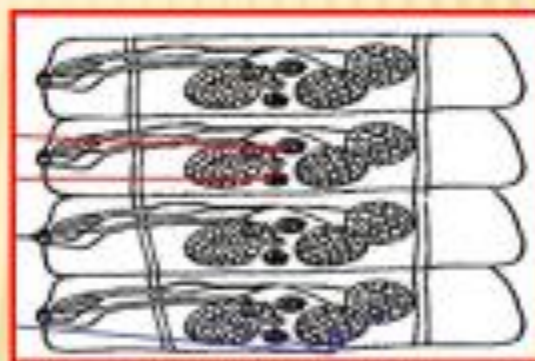
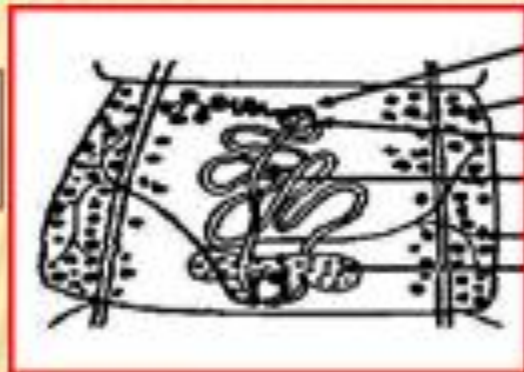
Pseudophyllidea

Cyclophyllidea

Scolex



Mature segment



Gravid segment

No gravid segments



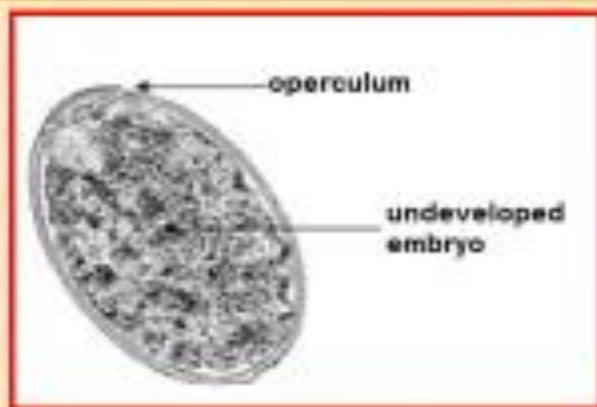
*Diphyllobothrium latum*

*Hymenolepis nana*

*Taenia saginata*

## PseudoPhyllidea

Egg of  
*D. latum*



Coracidium



Procercoid  
larva(solid)

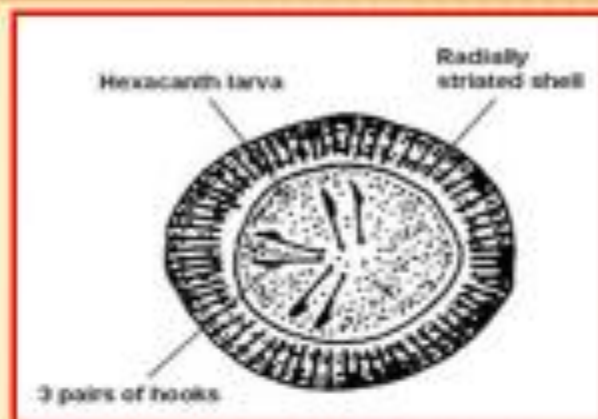


Plerocercoid  
larva(solid)

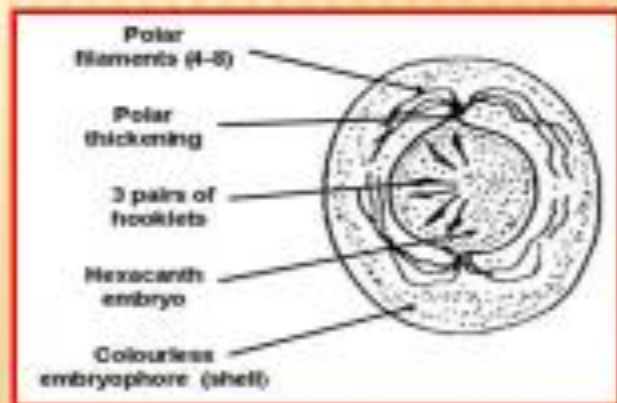


## Cyclophyllidea

Egg of  
*Taenia*



Egg of *H. nana*



Cystic  
larvae



# Cestodes are classified according to habitat into

## Intestinal cestodes

(Adult in the small intestine of man)  
(Man is the D.H)

- 1- *Diphyllobothrium latum*
- 2- *Taenia saginata*
- 3- *Taenia solium*
- 4- *Hymenolepis nana*

## Tissue cestodes

(Larvae in the tissues of man)  
(Man is the I.H)

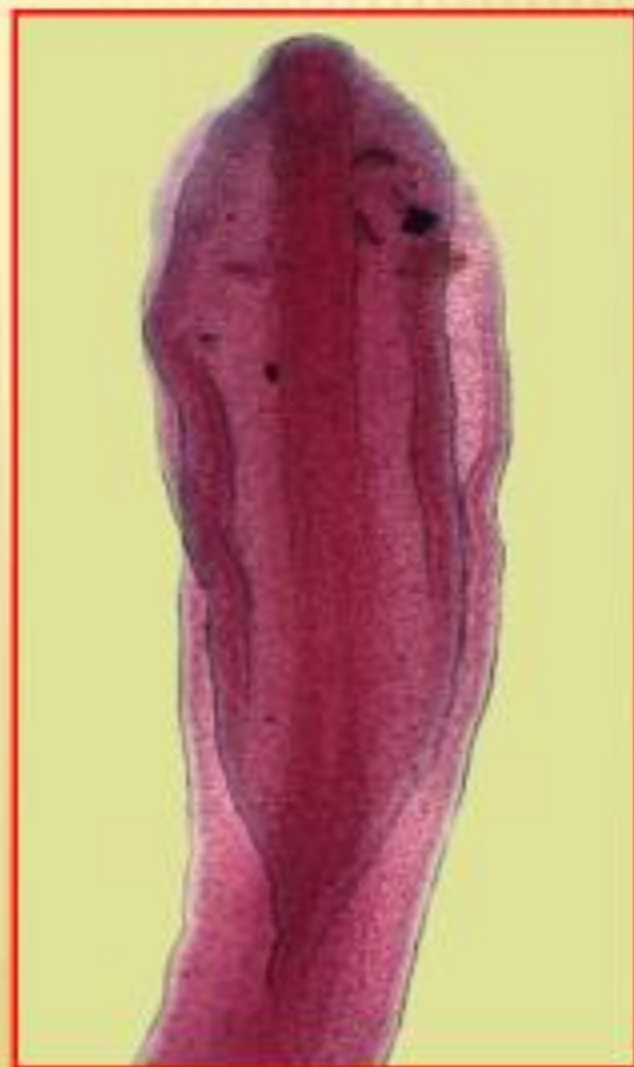
- 1- *Cysticercus cellulosa* (larva of *T. solium*)  
⇒ Cysticercosis
- 2- Hydatid cyst (larva of *Echinococcus granulosus*) ⇒ Hydatidosis
- 3- *Cysticercoid nana* (larva of *H. nana*) ⇒  
*Cysticercoid nana*

⚠ N.B: *H. nana* & *T. solium* are considered as intestinal and tissue cestodes

*Diphyllobothrium latum*  
(broad tapeworm , fish tapeworm)

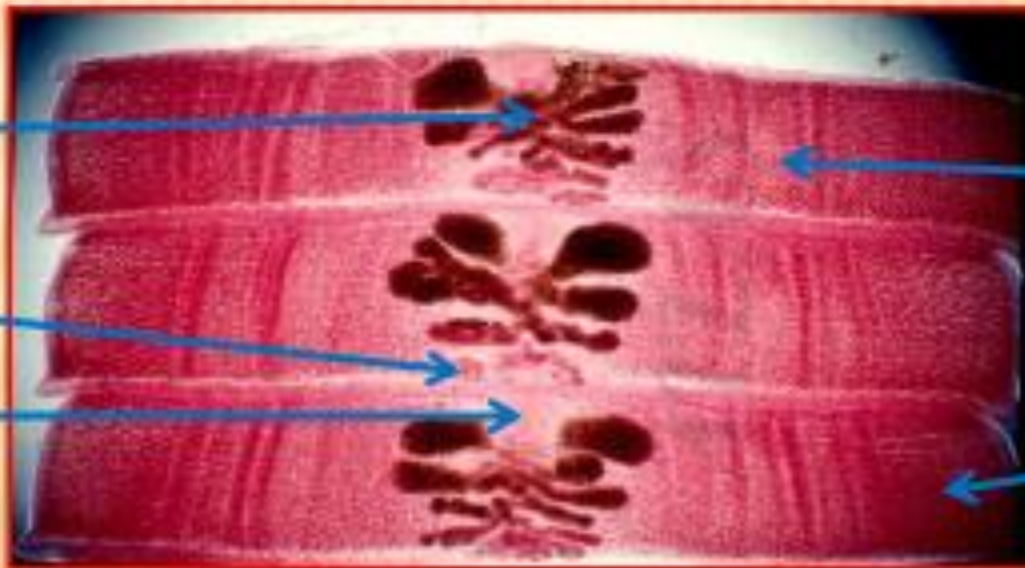
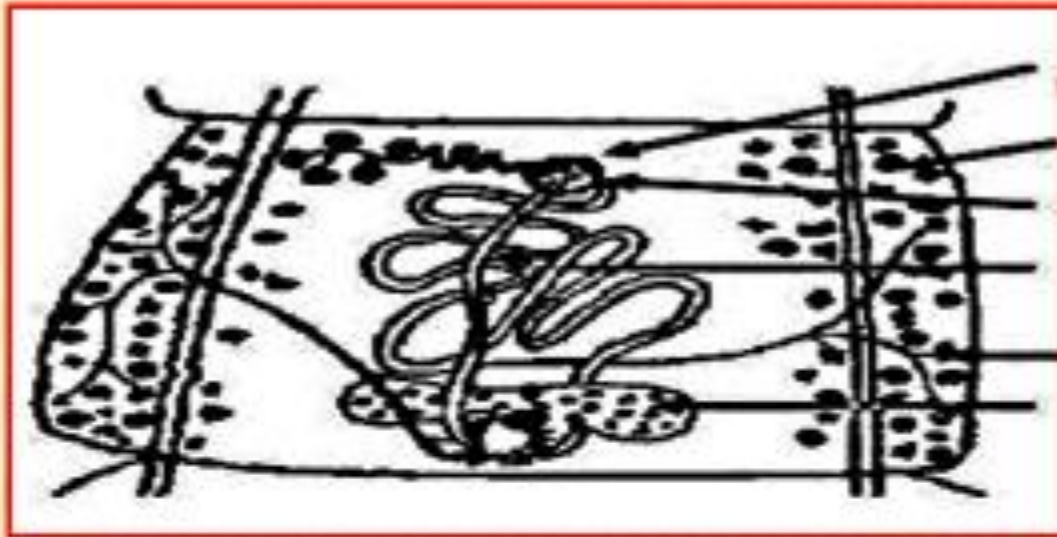
**Scolex**

Elongated, almond like with  
two grooves (bothria), one  
dorsal & one ventral.





# *Diphyllobothrium latum* mature segment



Uterus

Ovary

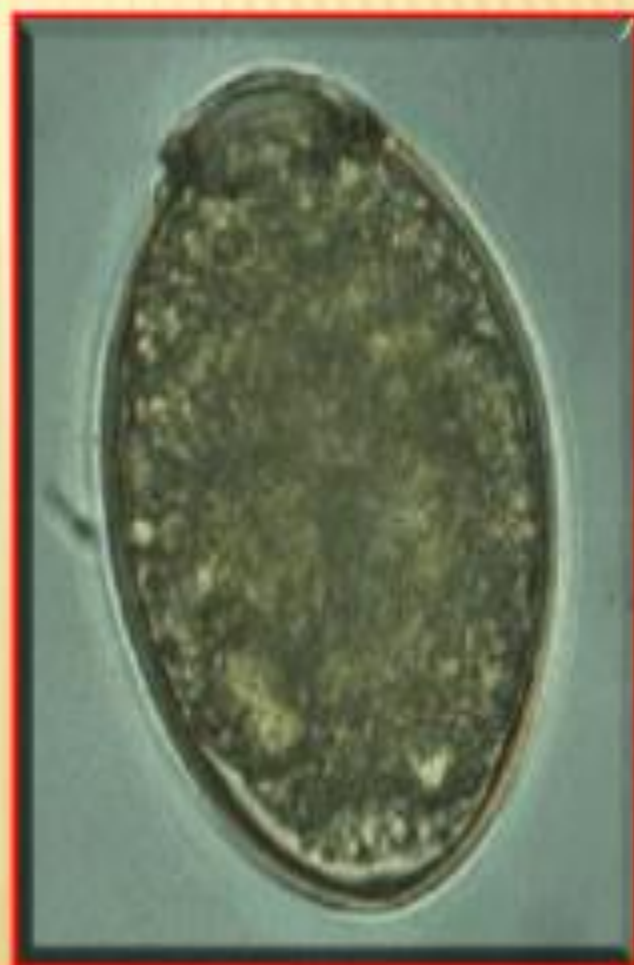
C.G.P

Testes

Vitelline glands

## *Diphyllobothrium latum* egg

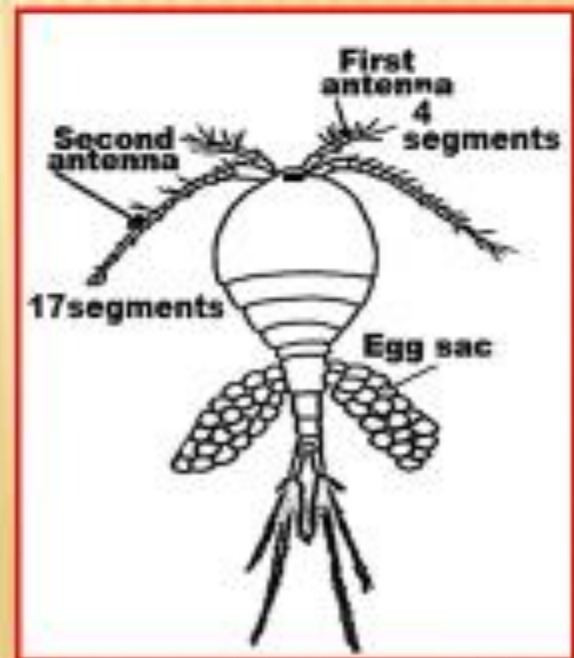
- **Size** : 70×45 μm
- **Shape** : Oval.
- **Shell** : Thick and operculated.
- **Color** : Yellowish brown.
- **Content** : Immature (ovum and yolk cells).



➤ **Coracidium** : Onchosphere larva with ciliated epithelium containing hexacanth embryo.

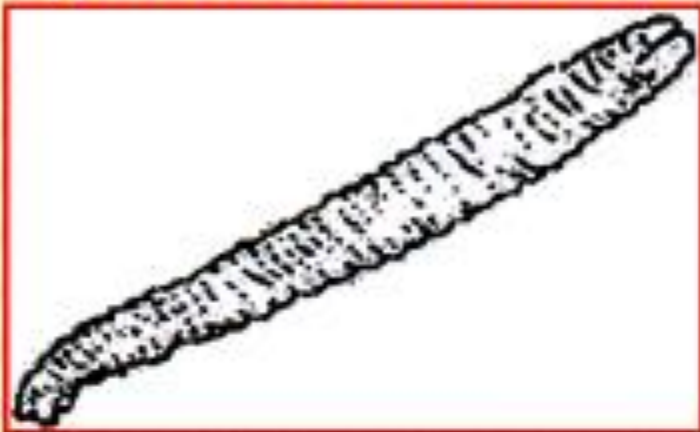


**Cyclop**: 1<sup>st</sup> I.H of *Diphyllobothrium latum* containing proceroid larva.



## Larvae of *Diphyllobothrium latum*

### Plerocercoid (I.S)



Solid larva with striated  
body found in 2<sup>nd</sup> I.H  
(Salmon fish).

### Procercoid

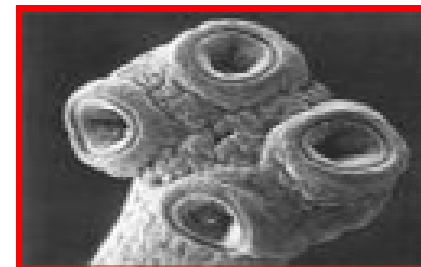


Solid elongated larva,  
with posterior spherical  
end having 6 hooks found  
in 1<sup>st</sup> I. H (Cyclop).

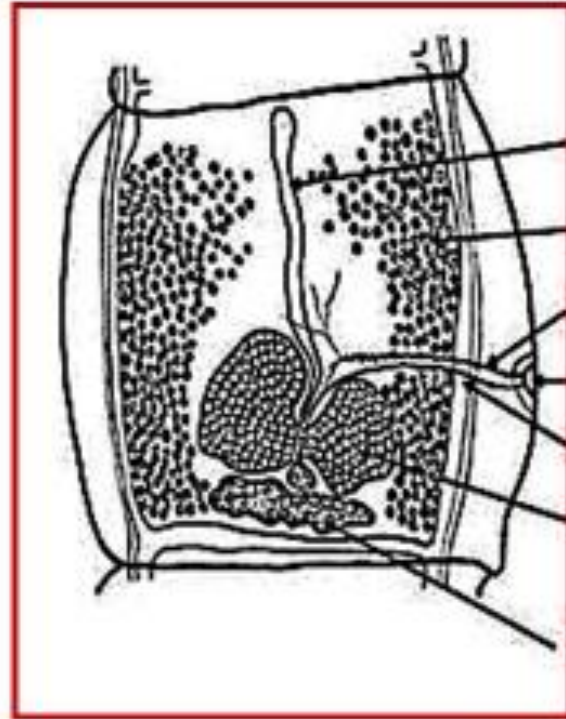
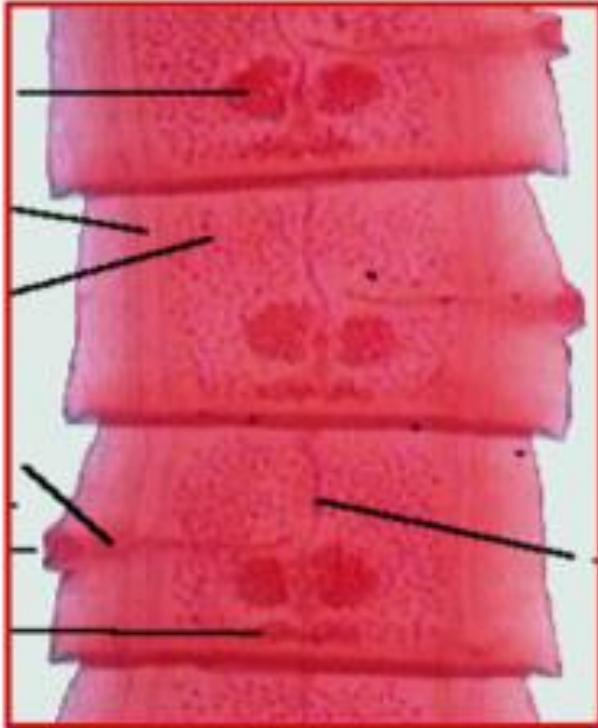
# *Taenia saginata*

## 1) Adult :-

- **Size** : 4-10 meters.
- **Scolex** : Globular, with 4 cup shaped suckers at the angles of the head. **No rostellum or hooks.**
- **Strobila**: 1000 - 2000 segments.
  - Immature segments.
  - Mature segments.
  - Gravid segments.



## Mature segment of *T. saginata*



Squarish in shape  
Contains male & female genital systems

## Gravid segment of *T. saginata*

- Longer than broad
- Uterus with 15 - 30 (18) lateral branches on each side
- Full of eggs.
- Detached **singly** out of the anus (with feces or actively migrate).



## ***Taenia solium***

### **1)Adult :-**

➤ **Size: 4-6 meters.**

➤ **Scolex :-**

- Globular.

- 4 cup shaped suckers.

- Rostellum with 2 rows of taenoid hooks (short handle, guard & long blade).

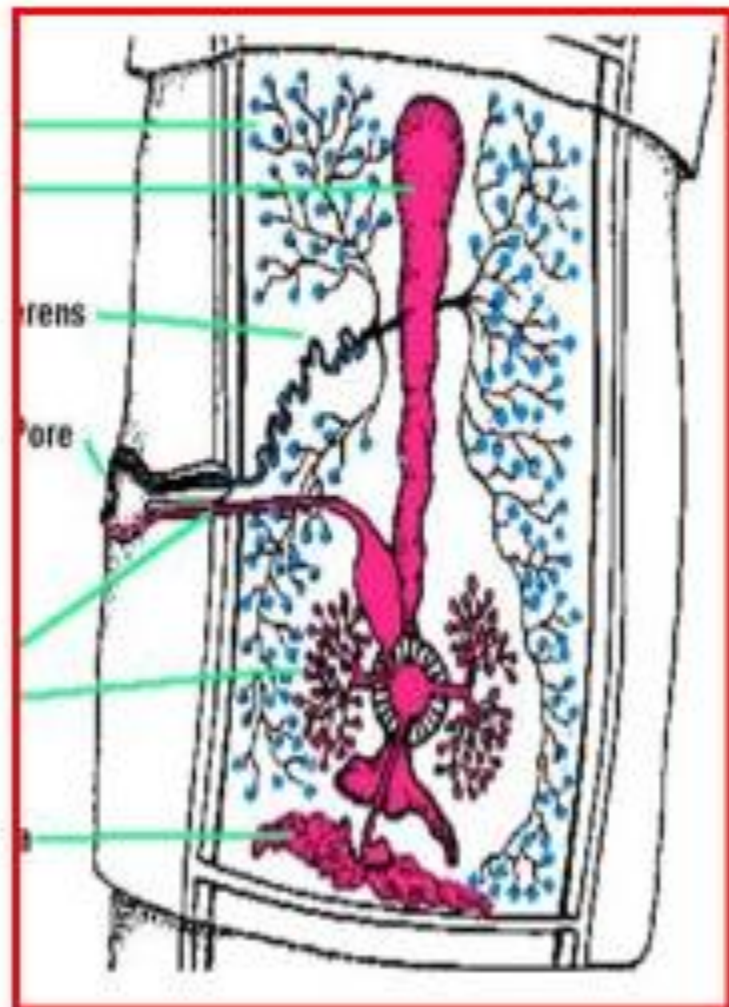




## Mature segment of *T. solium*

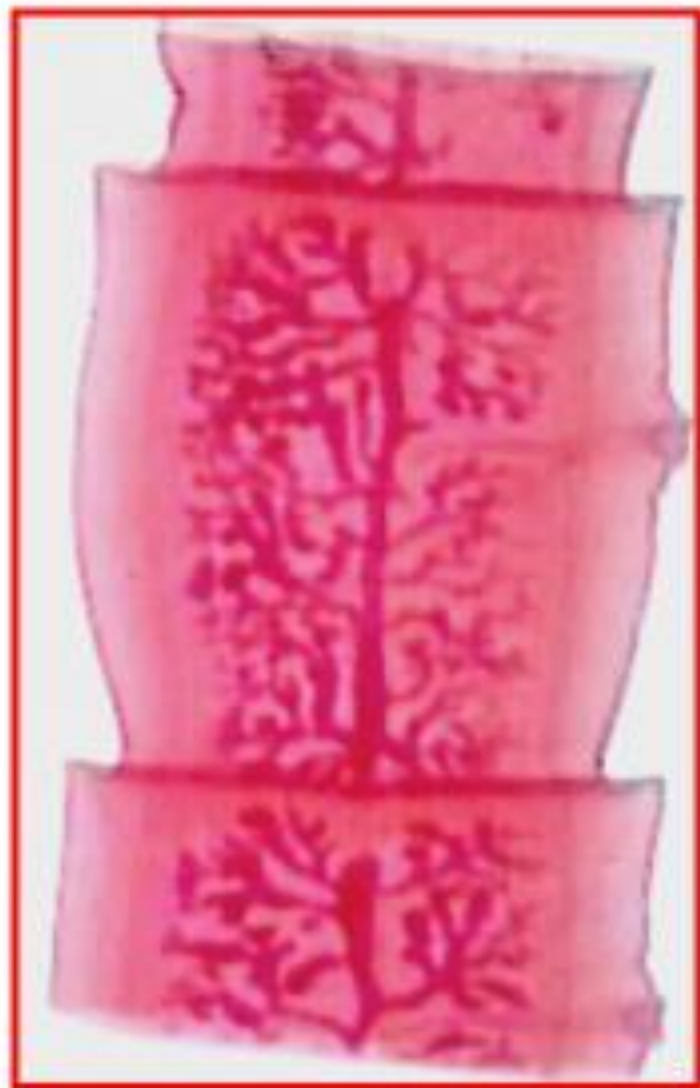
**Strobila** : About 1000 segments:-

- Immature segments.
- Mature segments :
- Similar to *T. saginata* except :-
  - \*Smaller.
  - \*Testes : Fewer.
  - \*Ovary : Trilobed.



## Gravid segment of *T. solium*

- Gravid segments :
- Similar to *T. saginata* except:-
  - 1 - Smaller.
  - 2 - Uterus: About 9 lateral branches on each side.
  - 3 - Segments detach in groups.



## Egg of *T. saginata* (D.S)

**Size** : 30- 40  $\mu\text{m}$  in diameter.

**Shape** : Spherical.

**Shell** : Thick, radially striated.

**Color** : Yellowish brown.

**Content** : Mature hexacanth embryo.

Egg of *T. solium* similar to *T. saginata* but it is the infected stage to human causing cysticercosis



## Cysticercus bovis of *T. saginata* (I.S)

- Cystic larva of *T. saginata* found in beef.
- Lined with germinal epithelium & contain fluid.
- Has invaginated scolex with 4 suckers (without hooks).



## **Cysticercus cellulosa of *T. solium* (I.S)**

**Similar to cysticercus bovis, but detected in pork and the invaginated scolex carries 4 suckers, rostellum and hooks.**



# Diagnosis of Cysticercosis

## A. Direct methods:

- Biopsy from nodules for detection of larvae.
- CT and MRI for brain infection.
- X ray for calcified cyst.
- Ophthalmoscope for eye infection.
- Surgical removal for detection of the larvae.
- Stool examination for detection of eggs or gravid segments (only in patients having the adult worm).

## B. Indirect methods:

- Serological tests.
- Eosinophilia.

***Taenia saginata*  
scolex**

***Taenia solium*  
scolex**



**Rostellum  
with 2 rows  
of hooks**

**Suckers**



**Globular, with 4 cup shaped suckers at the  
angles of the head**

Thank You

The image features the words "Thank You" in a large, 3D, light purple font. The letters are arranged in a slightly staggered, horizontal line. Two monarch butterflies, with their characteristic orange and black wings, are perched on the letters. One butterfly is on the letter 'n', and the other is on the letter 'o'. The base of the letters is decorated with a dense, textured green material that resembles grass or foliage. The entire graphic is set against a plain white background.