

# A PROJECT ON LIFE CYCLE OF

## FASCIOLA HEPATICA

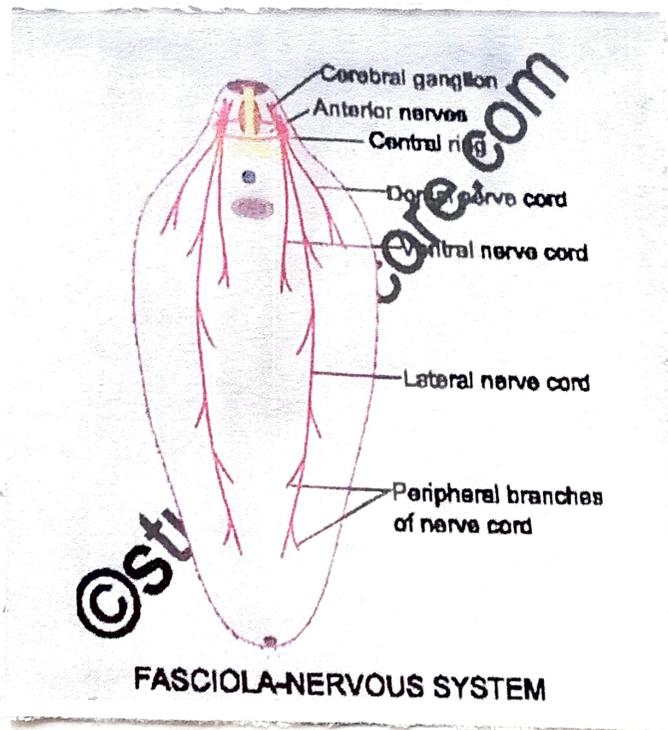
Submitted for partial fulfilment of B.Sc 1<sup>st</sup> Sem

Zoology Honours Curriculum of DU)

To,

The Department of Zoology

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## Certificate

This is certificate that the project report entitled "Life cycle of Fasciola hepatica" submitted for Bachelor of Science, degree course in zoology to fulfill the curriculum under Dibrugarh university by Miss Bristi Kachari Roll No-78 under my supervision and guidance (she initiated this work in 2 November and completed of her works in 14 November). The contents of her work are the results of her effort. I found her sincerity and a scientific temperament within her during the entire period of her experiment. I wish her bright future.

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## Acknowledgement

It is my great privilege and honour to convey my heartfelt gratitude and thanks to everyone who have contributed their best possible way for the successful completion of this project work.

The study has been undertaken and completed under the inspiring guidance of Miss Shyamalima Hazarika, Department of Zoology. I express heartfelt thanks and deepest gratitude for her valuable guidance during the entire course of this project.

My immense gratitude to all the teachers of the Department of Zoology, N.N Saikia College, Titabori and all my friends who have generously offered their moral support directly or indirectly for completing my project.

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## Introduction

*Fasciola hepatica* is commonly ~~called~~ as liver fluke or *distomum hepatica*. The adult liver fluke is a parasite in the liver and bile ducts of various vertebrates such as sheep, goat, cow, pig and some times of men. It infects various mammals including human and is transmitted by sheep and cattle to human the world over. The disease caused by the fluke is called Fascioliasis or fasciolosis which is a type of helminthiasis and has been classified as a neglected tropical disease.

### Classification

Phylum: Platyhelminthes

Class: Trematoda

Order: Digenea

Genus: Fasciola

Species: Hepatica

Fascioliasis is currently classified as a plant/food Trematoda infection often acquired through eating the parasites metacercaria encysted on plants. *Fasciola hepatica* is a cosmopolitan pathogenic polyxenous parasite found in the bile duct and biliary passages in the liver of sheep and other herbivorous mammals and other

## AIM AND OBJECTIVE

- To study the morphology of Fasciola hepatica.
- To study the lifecycle of Fasciola hepatica.
- To study the pathogenicity of Fasciola hepatica.

## Methods and Materials

*Fasciola hepatica*. In order to prepare the project, book, internet, youtube videos photographs etc have been used to obtain the necessary information for the project. The photographs attached to the project were collected from the internet

The tools required for this project are—

- 1) Photograph
- 2) Pen
- 3) Pencil
- 4) Books
- 5) The Internet (google, youtube video etc)
- 6) A4 size paper etc.

# OBSERVATION

Structure: Fasciola hepatica has a thin dorsoven- trally flattened leaf shaped elongated and oval body. It measures about 25 to 30 mm in length and 4 to 12 mm in breadth. Fasciola hepatica has its greater width at about the middle of the body and the posterior end is rounded it is usually pinkish in colour but it appears brownish due to ingested bile of the host.

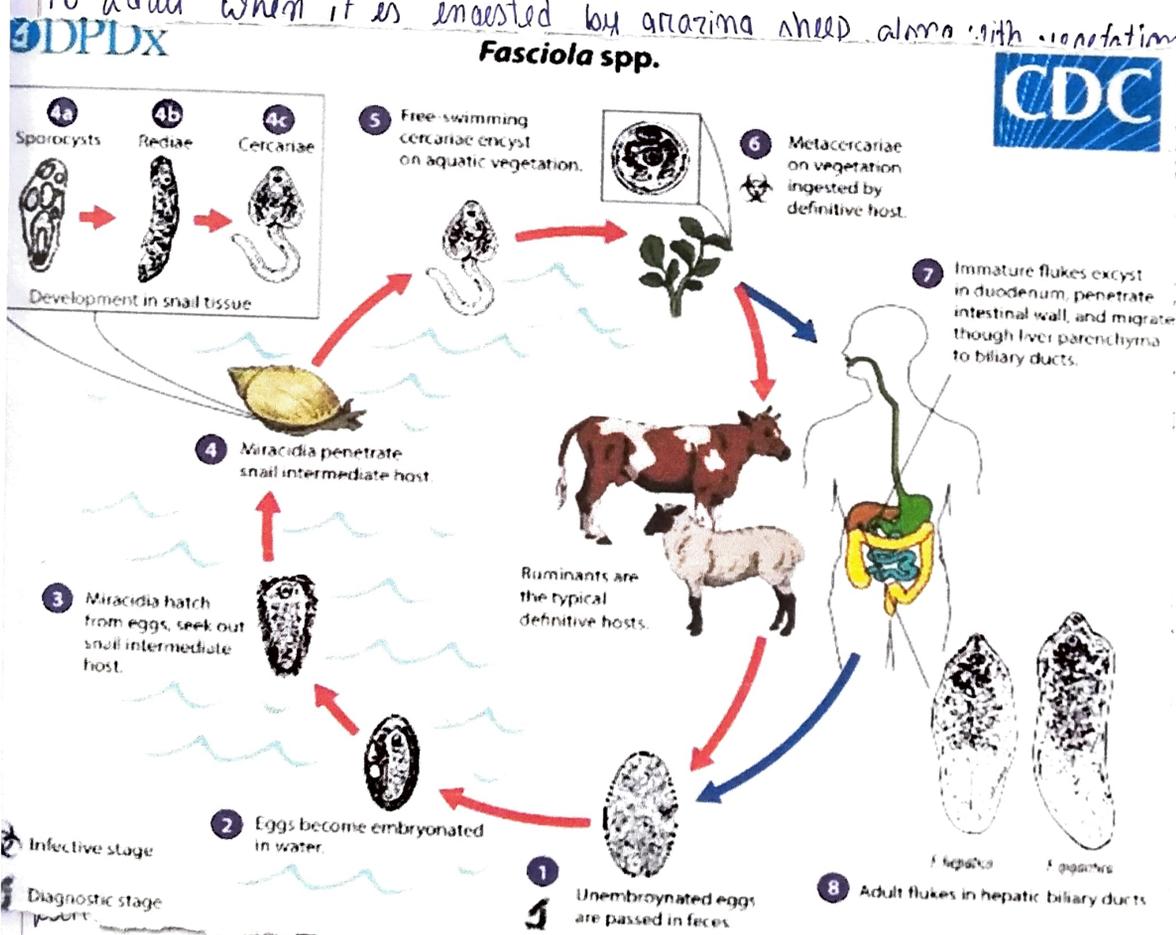
. Morphology: The anterior end of the body is distinguished into a triangular oral cone or head lobe giving it a shouldered appearance the head lobe at its tip bears a somewhat triangular aperture called mouth. There are two muscular organs suckers an oral sucker at the anterior and encircling the mouth and a large ventral sucker or acetabulum situated mid-ventrally about 3 to 4 mm behind the oral sucker. The suckers are cup like muscular organs meant for attachment to the host by vacuum. In addition to mouth aperture. There are two permanent apertures on the body one situated mid ventrally in front of the ventral sucker is the common genital aperture or gonopore and the other is situated at the posterior end of the body is called the excretory pore.

• Nervous system: A nerve ring surrounds the oesophagus. It has a pair cerebral ganglia dorsolaterally and a ventral ganglion below the oesophagus. Small nerves are given and out anteriorly from the ganglia posteriorly three pairs of longitudinal nerve cords arise from the ganglia. A dorsal a lateral nerve cord are best developed and they run to the posterior end. Nerve cords are connected by transverse commissures and they give out many small branches some which from plexuses. The nerve cells are mostly dipolar due to parasitic life sense organs are lost in adult Fasciola.

• Excretory system: The excretory system of Fasciola hepatica is concerned with excretion as well as osmoregulation. It consists of a large number of flame cells or flame bulbs of protonephridia connected with a system of excretory ducts.

• Reproduction: Liver flukes reproduce both sexually and asexually. Adults are hermaphroditic capable of both cross and self-fertilization. The larva stage known as sporocyst reproduces asexually with its offspring developing into miracidia which also multiply asexually. Adults live in the bile duct of their mammalian host.

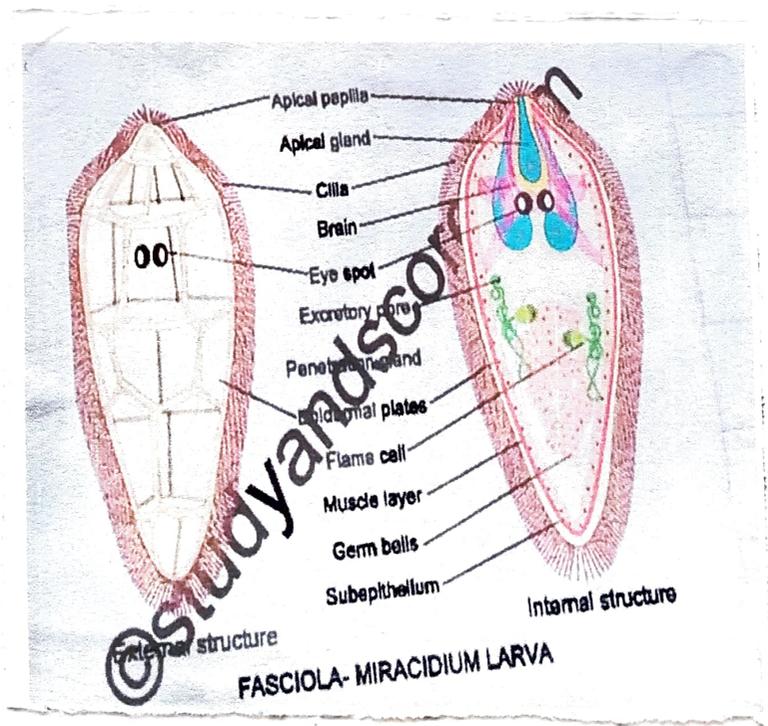
Life cycle: *Fasciola hepatica* is a digenetic parasitic that completes its life cycle in two hosts. Sheep is the primary host (cattle or men) and mollusc is the secondary or intermediate host, adults live in the bile duct of sheep, they are hermaphrodites and reproduce sexually their are several stages and hence the development is indirect. Infected sheep releases the fertilized egg along with its faeces when the eggs come in contact with water free miracidium hatches out. Miracidium penetrates the secondary host. Although the parasite doesnot mature sexually in the secondary host but if required for completion of life cycle is completed within 80 to 60 days. The cercaria leaves the snail and converts to metacercaria (rusting stage). Metacercaria is converted to adult when it is ingested by ruminant sheep along with vegetation.



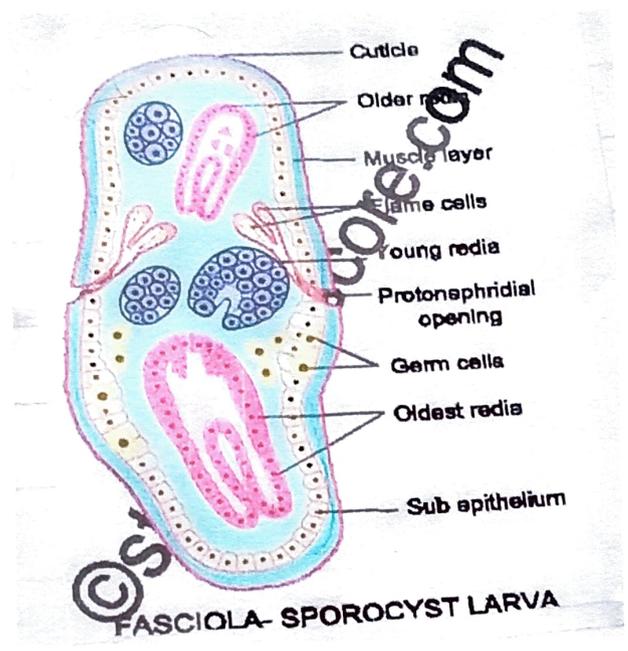
With water the egg can also survive in damp fecal matter for several months.

Larval stage: There are five larval stages in the life cycle of *Fasciola hepatica* - miracidium larva stages, sporocysts larva, Redia cercaria and Metacercaria.

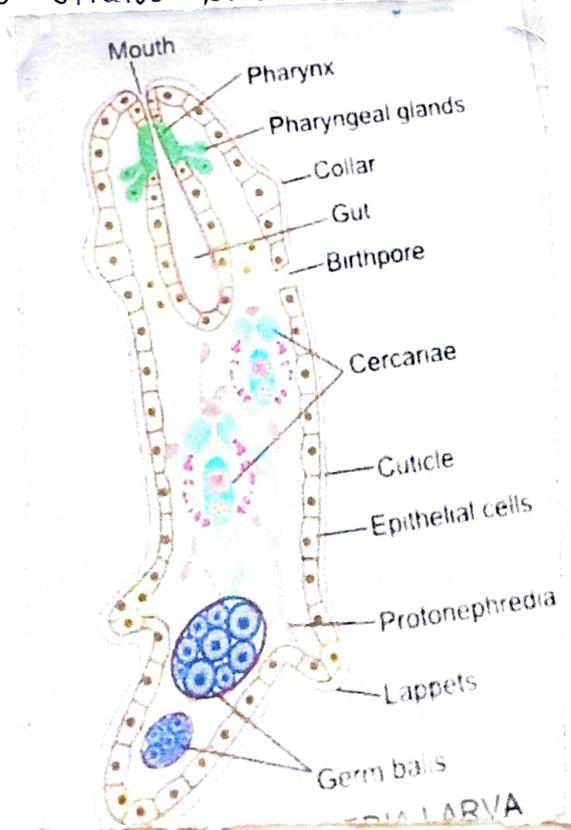
Miracidium: Under favorable condition 4.2 to 9 optimum temperature ~~are~~ 10°C to 30°C the egg different into miracidium larva. The development is slow at low temperature where as it steps above 37°C under these condition. The egg shell separates of at one end and swims actively with the help of cilia. The larva doesn't feed and swim in search of the host when they encounter the intermediate host the small. It penetrate in by the help of its head lobe. The miracidium dies in about 24 hours if do not find its suitable host.



B. Sporocyst: The miracidium move to the digestive gland or pulmonary sac of the snail. It lyses the ectoderm and rapidly grows to form a sac like structure. It sporocyst within 2 weeks it converts to sporocyst.



C) Redia: Redia larva emerges out of the sporocyst and migrates to other part of the snail usually liver.



D) Cercaria: Cercaria comes out of the redia by birth pore and moves to the digestive gland of the snail

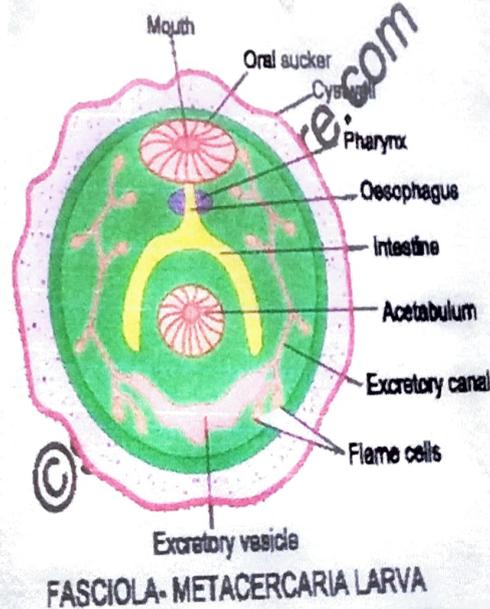


Fig: METACERCARIA LARVA

E) Metacercaria: The cercaria emerges out of the snail's body after 2 to 3 days. It loses its tail and becomes encysted. The encysted known as metacercaria remain attached to aquatic vegetation.

The detail life cycle is described below:

1. Copulation: Although *Fasciola hepatica* is hermaphrodite but self fertilization is rare. The adult worm capsules in the little duct of sheep during the process of copulation the cirrus of one worm is inserted to the Laurer's of the other and the sperms are injected.
2. Fertilization: Fertilization is internal the sperms fertilizes the egg in the distal end of oviduct. The fertilized egg then passes to the uterus.
3. Formation: The fertilized ovum is surrounded by yolk cells that secrete yolk. The yolk cells (or called vitelline cells) also secrete that shell material that hardens due to the action of quinone when it enters the uterus the egg with the shell are generally found as capsules the capsules is oval shaped and measures about 130-150  $\mu\text{m}$  in length and 60 to 90  $\mu\text{m}$  width the colour from yellowish to light brown it contains a small opening called operculum.
4. Embryonic development: Cleavage begins in uterus first cleavage is unequal resulting in two cells and small granular propagatory cell and large somatic cell the somatic cells undergo repeated division to form ectoderm of larva. The propagatory cell divides and gives rise to larva body and germ cells. The capsule move to the digestive tract by common bile duct and is finally released along the faeces. Further development continues when the eggs come in contact with water. The eggs can also survive in damp fecal matter for several months.

5. Larval stage: There are five larval stages in the life cycle of Fasciola. Miracidium larva, sporocyst larva, Redia, cercaria and Metacercaria.

A. Miracidium: Under favorable condition (pH 4.2 to 9 optimum temperature  $10^{\circ}\text{C}$  to  $30^{\circ}\text{C}$ ) the egg differentiates into miracidium larva. The development is slow at low temperature whereas it stops above  $37^{\circ}\text{C}$ . Under these conditions, the egg shell separates off at one end and the ciliated embryo or miracidium is released out and swims actively with the help of cilia. The larva does not feed and swim in search of its host the snail in penetrates in by the help of its head lobe the miracidium.

B. Sporocyst: The miracidium move to the digestive gland and pulmonary sac of the snail. It loses its ectoderm and rapidly grows to form a sac like structure, the sporocyst. Within 2 weeks it converts to sporocyst.

① Redia: Redia larvae emerges out of the sporocyst and migrates to other parts of the snail usually liver.

② Cercaria: Cercaria comes out of the redia by birth pore and moves to the digestive gland of the snail.

③ Metacercaria: The cercaria emerges out of the snail body after 2 to 3 days. It loses its tail and becomes encysted. The encysted cercaria known as metacercaria remain attached to aquatic vegetation.

6. Infection to primary host: Metacercaria can survive for adult one year on vegetation at low temp. When sheep feeds on vegetation infested by metacercaria larva enters the gut the cyst wall dissolves off by the action of lytic enzyme of the worm and the young fluke liberates. The young fluke penetrates the intestinal wall and finally moves to the bile duct where it grows into an adult fluke and reach sexually maturity. After about 12-14 weeks of ingestion they beg into lay eggs.

7. Alternation of generation: Thus the life cycle of fasciola hepatica alternates between sexual (adult fasciola) and a series parthenogenetic generation (larval)

pathogenicity of Fasciola hepatica: Fasciola hepatica infection has different stages is having different symptoms. The first stages of the illness occurs when the parasites perforates the liver and towards the biliary radical. Through liver pore chyma. This occurs within 1-3 month following ingestion of metacercaria the stage is characterized by liver, rashes, acute pain. In night hypochondria.

In the second stage the patient suffers with intermittent right upper quadrant pain. with or without shalams gets Eosinophilia also seen second stage.

Effect on sheep: Fasciola hepatica is responsible for a disease known as liver rot or fascioliasis when metacercaria are ingested by normal host they exist the intestine and the liver that effect both the structure and function of the liver. within the bile duct they destroy the epithelium

causing inflammation in the bile duct they may also interface with the normal bile duct leading to obstructive jaundice. The wall of the animals adult thickens due to development of fibrous tissues symptoms are more severe in lambs the animals suffers from acute anemia, low appetite, vomiting, diarrhea increase respiration are common symptoms breeding and lactation also declines effect human. Human are accidental host and become infected when they eat vegetables containing existing organisms or drinking contaminated water who has recognised fascioliasis as a important disease in human. Human fascioliasis occurs world wide and significant human cases are reported in eastern Europe, from northern (common) fluke *Fasciola gigantica* is commonly found in these animals *Fasciola hepatica* is zoonotic infecting man in Cuba France Algeria ecologically sheep and cattle raising areas are primary zoonosis where human infections are prevalent.

# CONCLUSION

People can protect themselves by not eating raw watercress and other water plants especially from Fasciola-endemic grazing areas. As always to areas, with poor sanitation should avoid food and water that might have been irrigated with polluted water should be thoroughly cooked as should thoroughly cooked as should viscera from potentially infected animals. Human fascioliasis occurs world wide and significant human cases are reported in Eastern Europe - from Northern Africa and South America.

## Reference

- Non chordata .
- <https://byjus.com> .