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B.sc Zoology (Hons) Part 1
Paper – 1(A)

Describe parasitic adaptation in platihelminths?

Introduction

- Platyhelminthes is a Greek term. (Gr. Platy=flat, helminth=worm).
- This term was coined by Gegenbaur.
- This name indicated the dorso ventrally flattened nature of the body.
- They have a solid body plan with parenchyma between the gut and the body wall.
- They also have a very well developed and a complex reproductive system.
- The phylum Platyhelminthes includes flatworms like Planarians, Flukes and Tapeworms.

General Characters of Phylum Platyhelminthes

1. These are mostly parasitic. Some are free-living. The free living forms are chiefly aquatic and the majority are marine forms. A few are terrestrial, confined to humid areas.
2. They are triploblastic animals having three primary germ layers viz., ectoderm, endoderm and mesoderm. Mesoderm contributes to the development of true muscle tissue.
3. They show bilateral symmetry and cephalization.
4. They exhibit organ system of organisation.
5. They are acoelomates and lack large fluid filled body cavity. Connective tissue compartments between the gut and the body wall is called parenchyma.
6. Gut is a blind sac. Mouth is used for ingestion and egestion. Anus is absent except in some turbellarians. Digestion is both external and internal.
7. Respiratory and circulatory system are absent.
8. Protonephridia or flame cells are primarily osmoregulatory and secondarily excretory in function. Most of the excretory wastes diffuse out through the body surface.
9. Cerebral ganglia constitute the brain. Longitudinal nerve chords are joined by transverse commissures at regular intervals fiving ladder like appearance.
10. Sense organs like ocelli and ciliary receptors occur in turbellarians.
11. Many turbellarians reproduce asexually by fission or budding.
12. They are mostly hermaphrodite. Some are unisexual (Eg: Schistosoma). Fertilization is internal.
13. Development is direct or indirect. Life history is simple in free living forms and is complex in parasitic forms. Polyembryony is common in trematodes

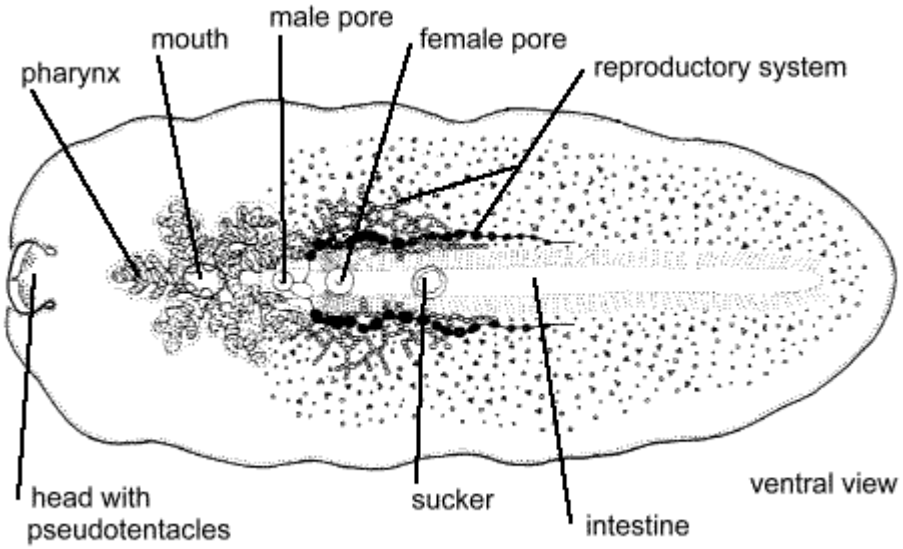
Parasitic adaptations of Phylum Platyhelminthes

Taenia is an endoparasitic worm residing in the internal organs like intestine of humans. To suit its parasitic mode of life it has to overcome to several adverse conditions. And accordingly this tapeworm shows several adjustments.

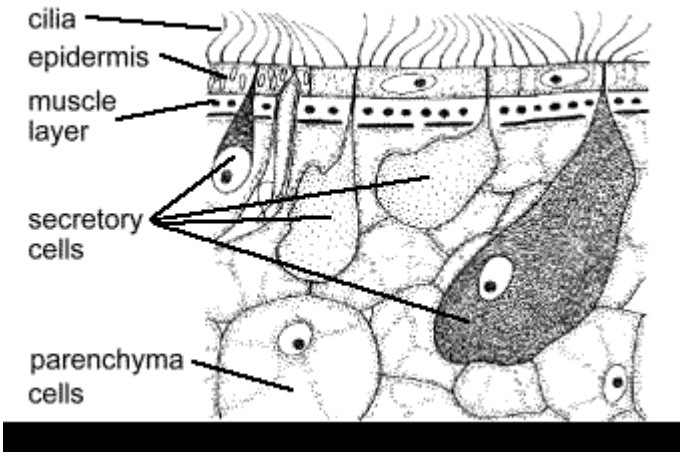
The following are the important parasitic adaptations of Taenia.

1. The body is externally covered by tegument which protects against the digestive action of the alkaline digestive juices of the host. This tegument is permeable to water and nutrients.
2. The osmotic pressure inside the worm is higher than that of the surrounding host fluid. This helps to permit ready absorption of the digestive food from the host.

3. Both the adults and larva lack cilia as there is no need of locomotion.
4. A well organized and developed scolex is present with suckers and spines. These suckers and spines help in attachment so that the parasite is not ejected from the host intestine due to peristaltic contractions.
5. They are located in the regions where there is continuous supply of pre-digested food material which can be readily absorbed by the parasite. Thus there is no need for alimentary canal. Also to increase the surface area of absorption tegument is modified into microvilli.
6. Circulatory, respiratory and sense organs are absent in these parasites.
7. Nervous system is also poorly developed as it is not needed.
8. Of all the systems, reproductive system is well developed. Enormous number of eggs is produced to overcome the hazards and challenges of survival.
9. Resistant shell around the zygotes and embryos gives them protection from unfavourable condition.
   Hermaphroditism and proglottization ensures self-fertilization within the same proglottid or cross fertilization with another proglottid of the same worm.



To adapt to marine life this flatworm uses diffusion to breathe and to distribute nutrients to other parts of the body.
Diffusion is where elements move from an area of high concentration to an area of low concentration.
A hydrostatic skeleton makes it easy for flatworms to adapt to aquatic life. It includes fluid held under pressure inside the body.



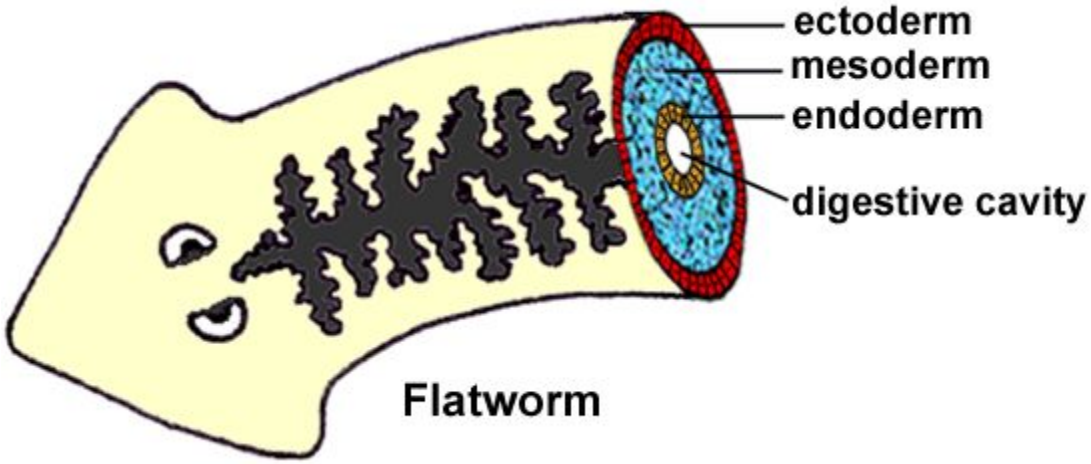
The outermost protection that these flatworms have is called the epidermis and it contains thousands of cilia (Seifarth, 2002).

Flatworms move in two ways: 1) with their cilia and 2) through the usage of muscle contractions. **Cilia**, tiny, moving bristles, join with muscles under the flatworm's skin to help them move about.

The flatworm uses its muscles to change the pressure of the fluid in its body (Cambell, 2008).

Flatworms are also triploblasts, meaning that there are three cell layers associated with them the **ectoderm** (outermost layer), **mesoderm** (middle layer) and **endoderm** (innermost layer); (Seifarth, 2002).

All of these layers work together to ensure high levels of plasticity for the organism. Plasticity just means how easily something can change shape.



The **ectoderm** houses thousands of cilia while the **mesoderm** has secretory cells muscles that regulate body plasticity.

The parenchyma cells inside the mesodermal section are home to a secretory cells. These cells release mucus through the flatworm's pores.
The mesoderm is lacking a proper coelom, making it an acoelmate.

Very unusual adaptations among flukes to increase the probability of finding a host and not being rejected once in a host.

Examples:

1. Stages adapted to ecology of hosts. For example, Schistosoma can penetrate host skin on contact. Other cercariae will encyst in muscle (fish-*Clonorchis*) or on plants (*Fasciola*) to increase changes of host encounters.
2. Fluke infestations can cause behavioral changes in the host. A fluke causes its periwinkle (mollusk) host to move up close to the surface in the intertidal zone where it is more likely to be eaten by the sea gull that serves as the alternate host. Another fluke causes its fish host to jump about making it more noticeable to the birds that prey on it. Another fluke causes its ant intermediate host to attach itself high on a blade of grass where it is more likely to be eaten by its final host (cow, sheep, etc.)
3. Fluke infestations can cause physiological changes in the host. There is parasitic fluke species that lives in snails in a salt marsh near Santa Barbara that castrates its host. The snail continues to eat algae, but it never reproduces and its food supports the parasite.
The presence of schistosomes induces antibodies that with the aid of macrophages and eosinophils protects the host from infection by a fresh crop of invaders but are incapable of harming the already-established worms. It appears that the resident worms coat themselves with host antigens, ABO blood group antigen and other histocompatibility molecules and thus disguise themselves as normal components of the body ("self").
4. Most do not cause problems unless infestations are extremely heavy. Most symptoms with lighter infections are due to inflammatory responses by host or problems with cysts.
Example: Lung fluke cysts can rupture and result in chest pain, and bad coughs. Eventually as worms increase can get symptoms very similar to pulmonary tuberculosis with chronic bronchitis and increased fibrosis of lungs. If encyst in brain, can get headaches, fever, nausea. visual disturbances and convulsive seizure**s.**