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Parasitism in Helminths

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Introduction:

Helminths or parasitic worms (Greek- helmins: a kind of worm) & helmenthology is the study of parasitic worm and their effect on the host. They are worm like organism that live and feed off living hosts, receiving nourishment and protection while disrupting their hosts nutrient absorption, causing weakness and disease. Approximately 3 billion people globally are infected with helminthes. They are characterized in to three groups- Cestodes (Tapeworm); Treamatodes (Flukes); Nematodes (Round worms). Morphologically differences are-

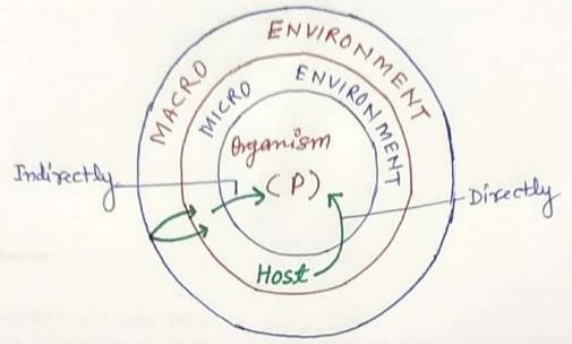
Feature	**Cestodes (tapeworm)**	**Trematodes (flukes)**	**Nematodes (round worms**
Shape	Segmented Plane	Unsegmented Plane	Cylindrical
Body Cavity	No	No	Present
Body covering	Tegument	Tegument	Cuticle
Digestive tube	No	End of cecum	End in anus
Sex	Hermaphrodite	Hermaphrodite (except Schistosoma)	Dioecious (cant not self fertilized)
Attachment	Sucker or bothridia & rostellum with hooks	Oral sucker or acetabulum	Lips, teeth, detanry plates
Disease	Tape worm infection	Schistosomiasis, Fasciolosis	Ascariasis, Filariasis

'Parasitism is an association between two organism of such a kind that on lives and feeds temporarily either in or on the body of other'

Parasitism in helminthes is an ecological concept where the parasite is subjected to a biological environment consisting of-

a) Micro environment
b) Macro environment

a) **Micro environment-** It is the space of host inside which the organism (P) lives. Thus the microenvironment affects directly to parasite. The changes inside the host body influence the parasites activities.

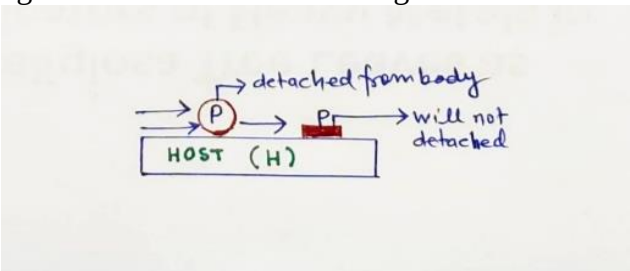


b) **Macro environment-** It is the surroundings of host. The environmental changes first affect the host activity and later on the organism is forced to face such as changes. Thus the macro environment affects the parasite indirectly. e.g. in the absence of food in the surrounding of the host, first the host dies which results later on in the death of parasite. The following factors govern the effective survival of the parasite-

- The parasite must be able to get on effective hold on host body or successful entry within the host.
- The condition within the host must be suitable.
- Parasite must be able to protect itself against the attempts of removal of the parasite by host.

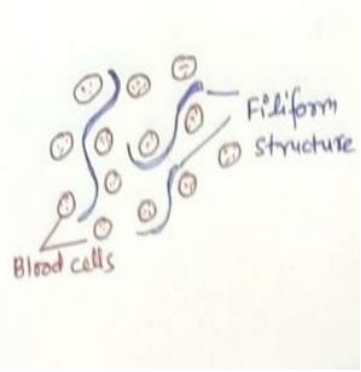
To achieve the requirements there are some parasitic adaptations, which can be either loss, or even development or modification of some organ system. While within the host parasite finds lies easy in some respects for example it does not have to find for food, but life is difficult for other problem-

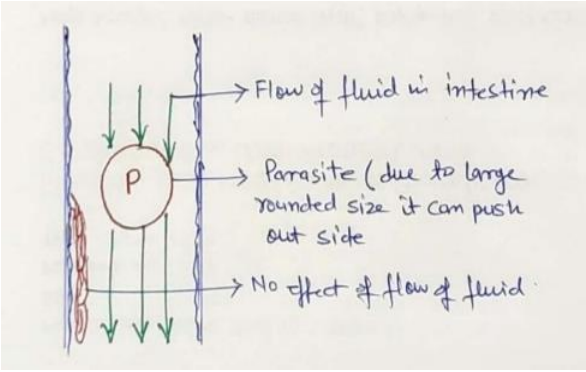
1. It has to fight against the defense of host and has to face great obstructions. To minimize the forces ectoparasites usually have a flattened body or darsolaterally compressed body to lesser the friction against medium. So as to strengthen it holds on host.



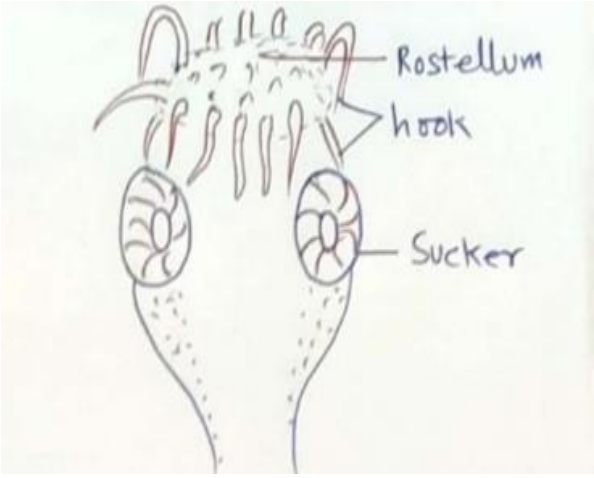
2. Endoparasite are three types with regards to shape-
   i. Parasite living within the cell/ tissue of viscera can become longer and more round in shape, because unlike the alimentary canal environment is comparatively less disturb within the tissue system.
   ii. The endoparasite living in the intestine and other part of alimentary canal are usually elongated because large sized parasite due to constant movement of food can push it outside and it will be detached. When it is thin and long it can be not affected by force of fluid examples- intestinal nematodes and cestodes.

iii. Parasites living inside blood example- *Cystosoma*, *Wuchereria* are filiform in shape which permits then to move easily within the blood stream of host.



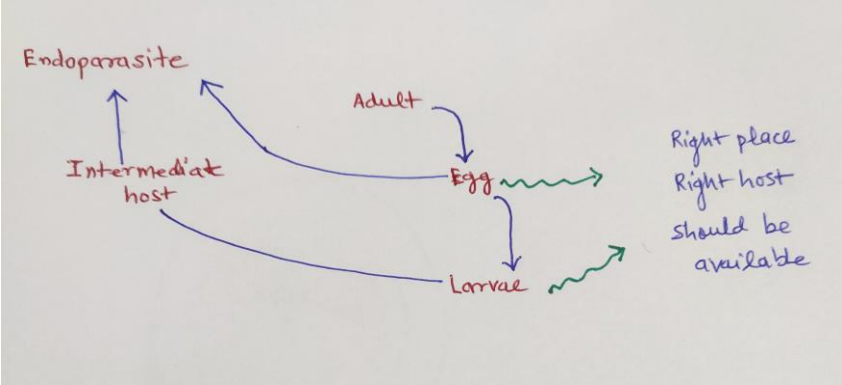


3. The parasites have to develop mechanical devices for securing and firm hold within the host so as to avoid thrown outside by the defense activity of host. To prevent it a large number of adhesive organs are developed in helminthes parasite as example- suckers of nematodes & hooks are hookworm.



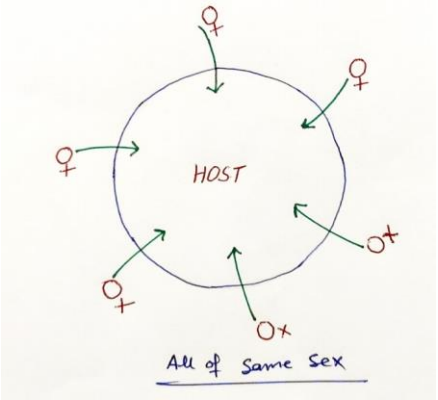
4. The food taken by the parasite from the host is already in digested condition and does not require any further digestion so it can utilize as such by the parasite. Therefore alimentary canal is reduced. Whenever, gut present it is used for storage not for digestion. Digestive system absent in cestodes.
5. Since have excess food at their residence there is no need for movement to get food. As a result locomotary organs are absent. Since, no locomotion co-ordination of nervous system. So, that nervous system simple and sense organs are also undeveloped (*Planaria*- eyespot if present- rudimentary). It can be absorbed all the food directly so the circulatory system is absent.
6. The excretory system and osmoregulatory system are not affected by the parasitic mode of life.
7. Parasite have not much O_2 around them because a little bit of O_2 is present in tissue cell. So it lives in more or less anaerobic conditions so it use to low O_2 tension. Therefore, respiratory system is absent. Parasite have a modified type of respiration in which it depends on anaerobic –glycolysis. During intermediate metabolism the O_2 is released, which is used in parasite again and very little aerobic respiration occurs. This mixture (anaerobic + aerobic) is called as Anoxybiosis.

8. Reproductive system is most effected system and show great complexity and elaboration. The parasite face a number of problem dispersal of its larval stages and their entry into new host provides a great obstacle and risk.
The entry of effective stage into the host and is almost totally dependent on chance, because the right type of the host has to be present at the right place at the right time.



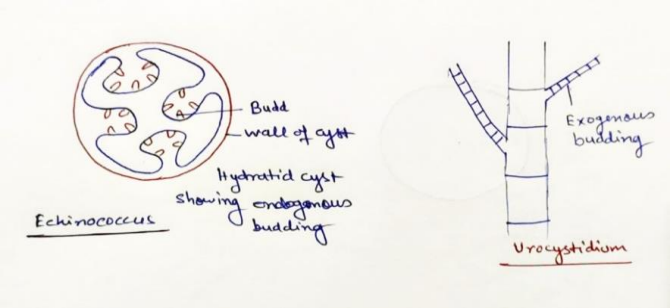
Therefore a large number of infective stages are likely to die without having choice entry in the host. Furthermore, the endoparasite living inside the host is completely (entirely) cut off from the outer environment, where the larval stages are dispersed. In this stage many of the larval produced by the adult may not reach the exterior at all and die them or many larval stages may reach the exterior but may get deposited on such places which are not suitable for their survival, so there are so many risks and uncertainty involve with the result, that the parasite have no other method except to produce a very large number much more than what is required. Helminthes parasite has been seen to have very great fecundity e.g. *Ascaris* (Giant round worm) produces 2 lakhs/day eggs; *Fasciola sps* (Flukes) produces 25 thousand/day; a nematodes *Haemanchus* (Red stomach worm) produces 5 thousand/day. So, many of its organ system is utilized for the elaboration of their reproductive system. The parasite face another type of problem that is the individual entry in host may all be one sex only. This would mean the race cannot propagate within that host.

To counteract this problem the parasite acquire a number of adaptations-



i. Parthenogenesis- females can reproduce without males as a example nematodes- *Heterodera glycines*, *Mermis nigrescens* & *Strongyloides stercoralis*.
ii. Hermaphrodite- where one individual bear both male and female sex organs as example- *Taenia*, *Hymenolepsis nana*.

iii. Asexual reproduction- parasite are capable of producing asexually by various types of budding e.g. *Urocystidium* shows exogenous budding (cestoda). Whereas endogenous budding is found in *Echinococcus*. *Cysticercus* larva of it shows internal budding.



The life history of parasite is also influenced by the parasitic mode of life and is so, planed as that achieve maximum infections of host. In case like *Fasciola* and *Ascaris* where infective stage passive entry into the host and has to wait a long time before it has come to enter in the host. The infective stage is make resistance to increase its life span. The cyst of *Fasciola*, metacercaria larva and the thick wall *Ascaris* are meant to make these infective stages to resistance, but still many of these infective stages never get a chance to enter the host e.g. cercaria of *Systosoma* and infective larvae of phytoparasitic nematodes have an active entry into the host. The timing of the life cycle are also adjusted in many cases, so as to achieve the maximum advantages for e.g. freshwater polystomum release its eggs only when frog tadpole have already hatch in the water medium. These increase maximum infections of tadpole with maximum number of parasite.

Major objects of all such modification in the reproductive system and in the life cycle produce maximum efficiency to reproductive activity. The parasite life show much advancement on reproduction, that it appears as parasite main objects of life is reproduce much as possible.

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