

## **PHYSIOLOGICAL ADAPTATION TO PARASITE HABITAT**

### **INTRODUCTION**

A parasite is an organism which lives in or on another organism (called host) and benefits by deriving shelter and nutrients from them. The parasitism is a type of negative ecological / biological interaction in nature where one organism gets benefited (the parasite) and the other is harmed (the host). i.e. parasites may be microbes such as bacteria, virus and Mycoplasma, or animals such as liver fluke, worms, nematodes, some insects and plants such as Loranthus, Cuscuta etc. All types of parasites show peculiar adaptations to survive in or on the host system and to maximum benefit from them. Parasites show three level adaptations, they are:-

1. Structural Adaptations (Morphological and Anatomical Adaptations)
2. Physiological Adaptation
3. Reproductive Adaptation

**Definition:** Any feature of an organism or its part which enables it to exist under conditions of its habitat is called adaptation. The adaptations are mainly to withstand the adverse conditions of the environment and to use the maximum benefit of the environment.

### **STRUCTURAL MODIFICATION (MORPHOLOGICAL AND ANATOMICAL )**

1. Feeding organs are usually absent in endoparasites.
2. Fluid feeding insects such as aphids have highly specialized mouth parts for the easy absorption of cell sap from the host.

3. The presence of well-developed piercing device in some parasites enables them to invade into the host tissue. Ex:- the stylet in nematodes.
4. Since endoparasite show restricted movement the locomotory organs are generally absent or highly reduced in them. Ex:- gut parasites such as *fasciola & taenia*.
5. The outer covering of the endoparasite is resistant to the enzymatic digestion of the host. Ex:-Fasciola
6. Sensory organs are highly reduced in internal parasites since the environmental conditions of endoparasites are relatively ---  
-constant.
7. The nervous system is highly reduced in most of the parasites.
8. Parasites usually have the reduced body size to occupy the niche in the internal or external surface of the host.
9. Most of the internal parasites are dorsi-ventrally flattened, which help the easy attachment to the host surface without any friction.
10. Some endoparasites such as *Ascaris* have highly muscular pharynx for the easy absorption of food materials from the host.
11. Development of haustoria in some parasitic plants for the absorption of nutrients from the host. Ex:- *cuscuta*
12. The haustoria in partial plant parasites (such as *Loranthus* ) are attached to the xylem of the host to absorb minerals and water from them.
13. The haustoria in complete plant parasites ( such as *cuscuta* ) are attached to the phloem of the host to absorb the prepared food material from them.

## **PHYSIOLOGICAL ADAPTATIONS OF PARASITES**

1. Parasites producing hydrolyzing enzymes to digest the host tissue. Ex:- Fungi produce a variety of hydrolyzing enzyme such as cutinase, cellulase, hemicelluloses, and pectinase to digest cell wall of the host plant.

2. The hydrolyzing enzymes are exoenzymes, produced in the external surroundings of the parasites.
3. Blood feeding parasite produce anticoagulant to prevent the clotting of blood in the gut of parasites. (ex:- hirudinaria)
4. Internal parasites have high chemo sensitivity to find the best location in the host.
5. Internal parasite produce digestive enzymes for the penetration of host tissue or organs
6. Internal parasites can respire anaerobically in te absence of oxygen or in anaerobic condition
7. There is a progressive tendency towards the reduction of the content of gut in some endoparasite since; many internal parasites have the capacity to absorb nutrients through the body surface.
8. Those internal parasites which don't absorb the nutrients through body surface will develop thick cuticle around the body from host enzymes.
9. All parasites especially endoparasite have high resistance to toxins or metabolites of the host origin.
10. Internal parasites have the ability to escape from the immunological reactions of the host.
11. Parasites generally attach host proteins to its external surface to escape from the host immunological responses.
12. Some parasites such as HIV and plasmodium often change their antigenic components to escape from the immunological reactions of the host.
13. Strategies by which parasites escape from the immunological reactions of the host antigen, antigenic variation, occupation of immunologically privileged sites, disruption of the host's immune response, molecular mimicry and loss or masking of surface antigens.
14. Endoparasite produce some anti enzyme compound which will neutralize or inactive the digestive enzymes of the host.

15. Endoparasite keeps their osmotic concentration equal or slightly lower than the host cell for easy absorption of water and nutrients.

## **REPRODUCTIVE MODIFICATION OF PARASITES**

1. Some are hermaphrodites. This allows them to self fertilize in the absence of the opposite sex in the internal conditions
2. The fecundity rate of parasites is very high since there is only a remote chance to find the correct host by the progenies.
3. Most of the parasites produce a large number of reproductive bodies such as eggs or sperm or cysts than their free living relatives.
4. Example:- *taenia soium* lays about 35000 eggs/day. *Fasciola hepatica* lays about 10000 eggs/ days, *ascaris lumbricoides* lays about 200000 of eggs/day
5. Reproductive bodies are tough and resistant when they are external to the host
6. The reproductive particles that secrete out of the host body are protected with very thick coat to prevent desiccation as in cysts.
7. Some parasites have highly complicated and specialized reproductive cycle.
8. Some parasites use of secondary hosts as vectors to increase the chance of their survival.
9. Most of the endoparasite sow one or more larval stages with more multiplication capacity (due to polyembryony) to increase the number of progenies Example:- nematodes
10. Rapid maturation capacity and extended life span in most of the endoparasite is another reproductive adaptation.