

its host. It causes the disease following symptoms: acute anaemia, appetite fever. The sheep becomes weak and lazy, milk production is yellowish and jaw muscles swell. Heavy infection of *Fasciola* causes death of the host within a few weeks.

3. **Treatment.** Anti-helminth drugs such as **emetin hydrochloride, phenothiazine, carbon tetrachloride, tetrachloroethane**, etc., are used to cure the sheep.

4. **Preventive measures.** Spread of infection of *Fasciola* can be prevented by

- (i) Killing heavily infected sheep.
- (ii) Introducing ducks in the ponds which eat up the intermediate host of *Fasciola*, the snail.
- (iii) Drying the ponds.
- (iv) By removing all vegetation around the ponds.
- (v) By adding copper sulphate in the pond. It kills the snails.

17.12 PARASITIC ADAPTATIONS IN *FASCIOLA HEPATICA*

Adaptations can be defined as modification of an organism or its parts that make it more fit for existence under the conditions of its environment. **Parasitic adaptations** can be defined as structural, physiological and behavioural modifications developed by the organism in order to lead a parasitic mode of life.

I. Structural Adaptations

A. Morphological adaptations

1. Flat and thin body enables *Fasciola* to live in narrow spaces. It minimizes the danger of injury in narrow spaces.
2. Adhesive organs are of two types and of highly muscular nature. They occur in the form of **anterior sucker** and **ventral sucker**. By the help of these suckers, parasite attaches itself to the host's tissues.
3. In *Fasciola*, there is no distinction of body into head, trunk and tail. Body is also without any appendages, since these might prove harmful in endoparasitic mode of life.
4. Resistant tegument or the cuticle is an important parasitic adaptation. The parasite remains unaffected by alkaline pH of the bile.
5. The spines in the tegument protect the body.

B. Anatomical adaptations

1. There are no locomotory organs. As *Fasciola* is endoparasitic, it does not need to make excursion for food and safety.
2. Terminal mouth is surrounded by a muscular oral sucker which helps in feeding.
3. The pharynx is muscular and suctorial. It is adapted to suck blood, bile, etc.
4. The intestine of *Fasciola* is highly branched. Its branches supply the digested food to all parts of the body. Thus, intestine has taken over the work of circulatory system.

5. *Fasciola* feeds on already digested food so the anus is not required. Thus, alimentary canal is incomplete and intestine ends blindly.
6. Endoparasite respire **anaerobically**, as there is almost no oxygen in the bile passage of host.
7. Excretory system is well developed. It consists of extensively branched system of excretory ducts ending into flame cells. This facilitates the collection of excretory products from the interior of body.
8. Nervous system is poorly developed and sense organs are lacking, since the endoparasite does not react with the external environment, and there are least changes inside the body of host.
9. Male and female reproductive systems are well developed. The highly branched ovary and testes are capable of producing large number of gametes.
10. The eggs are covered with resistant capsule.
11. Bisexuality offers full chances of fertilization.

II. Physiological Adaptations

1. *Fasciola* is well adapted to the osmotic concentration of the bile in which it lives.
2. Respiration is anaerobic.
3. *Fasciola* can absorb certain amino acids through its body wall (tegument) as extra amino acids are needed for protein synthesis in the eggs and larval production.
4. Osmoregulation is not needed since the osmotic concentration of body fluids of *Fasciola* is almost equal to that of the host's bile.

III. Behavioural Adaptation

Fasciola hepatica is a hermaphrodite animal but in it cross-fertilization is the rule. Copulation is mutual and reciprocal. The cirrus of one partner is inserted into the vaginal canal of the other partner and sperms are ejected. After copulation both flukes lay fertilized eggs. In this way the rate of reproduction is doubled.

IV. Modifications in Life Cycle

1. Very large number of fertilized eggs are produced.
2. The eggs are protected by the capsular covering.
3. The germ cells in a larva produce several new larvae asexually. This phenomenon is called **paedogenesis**.