For the Students of B.Sc (Part-1) (UG)

(Unit-2)

Life cycle and development of Fasciola hepatica

Life cycle of F. hepatica is completed in two hosts Primary host - in which the adult fluke lives and reproduces i.e Sheep and Intermediate host - in which numerous larval stages are passed is a Snail. Such this type of life cycle involving two hosts is called a digenetic life cycle.

The important stages of life cycle of F. hepatica is following -

1) Copulation → The copulation of F. hepatica take place in bile ducts of sheep fertilization is internal which may be self or cross fertilization.

2) Egg formation → Egg or zygote is surrounded by yolk cells and a layer of hard, resistant leathery chitinous substance forms outer layer and are called capsules about 3,000 or more such capsules may occur in a single flukes.

3) Cleavage and Embryonic development → Encapsulated embryos or eggs do not develop in fluke uterus a large no of eggs comes out in the sheep intestine through gonopore and finally ejected out with its faeces. It develops into a Miracidium larva after getting a moist and warm temperature.

4) Miracidium larva - The encapsulated larva after getting a suitable environment differentiate into a miracidium larva.

Miracidium larva is about 0.07 mm long oval, elongate and richly ciliated active creature having a broad anterior end produced into a mobile and non ciliated apical papilla. The miracidium larva contains a pair of penetration gland and after 24 hours of hatching it attached to the snails body through its apical papilla and by the help of secretion of apical gland it enters into its body.

Inside the snails digestive gland it undergoes various changes and in about 14 days develops into a second larval stage the Sporocyst larva.

Sporocyst larva - It is an elongated sac like structure retaining all the layers of body wall except cilia the organs and the miracidium gets degenerated the Sporocyst consist of germ balls after absorption of nutrition from the host the germ ball develops into the next larval stage the rediae. Each Sporocyst produces 5 to 8 rediae

Redia larva — Redia emerges from the Sporocyst by rupture of its body wall. It bears a mouth, a short pharynx and elongated sac like intestine Body of larva is packed with germ cells it moves in the body of host and gives rise to a second generation of rediae identical to the parents, the second generation develop into larva of next stage known as cercaria larvae.

Cercaria larva - Each redia produces about 14 to 20 cercaria larva which leaves the body of redia through its birth pore and enters snails digestive system. Mature cercaria makes its way through the host's tissue and escapes to the surrounding water. After an active life of 2 to 3 days it loses its tail and encysts to become a metacercaria larva. The cyst is produced by the cystogenous glands which degenerated later on. Encysted cercaria is injected by the primary host sheep and the cyst gets destroyed by the gastric juice and Metacercaria larva comes out.

Metacercaria larva — Metacercaria develops into an adult fluke inside the definitive host or sheep which gets infected by grazing on leaves and grass blades to which the larva remains attached. The cyst wall breaks and the larva after piercing the intestinal wall enters into the biliary bile duct and lives of host where it develops in an adult fluke, becomes mature and starts it starts producing eggs.

Significance of life cycle of Fasciola hepatica

(1) Complex life cycle → The life cycle includes two hosts Primary (sheep) and secondary (Snail), thus it is digenetic and due to the presence of several larval stages its a complex life cycle.

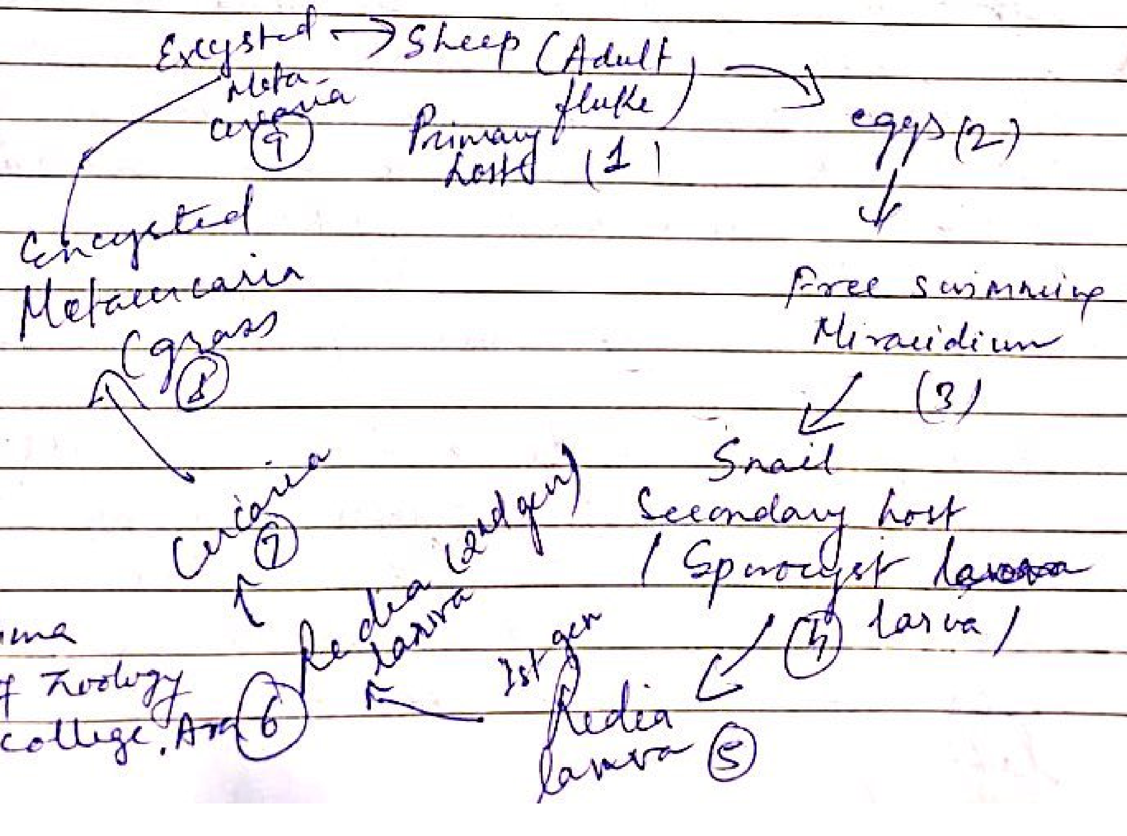
② Heterogamy – Presence of germ cells in the sporocyst and redia larva and the eggs producing parthenogenetically different larval stages is called heterogamy. Reproduction in immature larval stages is called Paedogenesis.

③ Polyembryony – The germ cells in sporocyst and redia larva are derived from first division of zygote. These germ cells multiply mitotically and produce subsequent larval stages this process of reproduction is called polyembryony.

(4) ~~Metag~~ Metagenesis — Alteration of asexual reproduction during immature stage with the mature stage i.e. in adult stage is called metagenesis.

⑤ Advanced larval stages – Miracidium and cercaria exhibit advanced features than the adult which degenerates to suit it parasitic mode of life.

Diagram of life cycle of F. hepatica



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