Course: Biology-IV (6454)
Semester: Autumn, 2021

ASSIGNMENT No. 1

Q.1 Write distinguishing characteristics of Acetospora.

The **Ascetosporea** are a group of eukaryotes that are parasites of animals, especially marine invertebrates. The two groups, the haplosporids and paramyxids, are not particularly similar morphologically, but consistently group together on molecular trees, which place them near the base of the Cercozoa. Both produce spores without the complex structures found in similar groups (such as polar filaments or tubules). Haplosporid spores have a single nucleus and an opening at one end, covered with an internal diaphragm or a distinctive hinged lid. After emerging, it develops within the cells of its host, usually a marine mollusc or annelid, although some infect other groups or freshwater species. The trophic cell is generally multinucleated. Paramyxids develop within the digestive system of marine invertebrates, and undergo internal budding to produce multicellular spores. A 2009 study concluded that Haplosporidium species form a paraphyletic group and that the taxonomy of the haplosporidians needs a thorough revision. Based on light microscopy, Hillman (1979) assigned the organism parasitizing Teredo spp. to the family Haplosporidiidae (Phylum Ascetospora, Class Stellatosporea, Order Balanosporida) and discussed similarities in size and shape of its spores to those of Haplosporidium nelsoni Haskin, Stauber and Mackin, the oyster pathogen commonly referred to as MSX. MSX has been implicated in mass mortalities of Crassostrea virginica Gmelin in both Delaware and Chesapeake Bays over the last thirty years, yet the life cycle of this parasite is unknown. Investigators have suggested existence of a reservoir host, a species other than C. virginica which serves as a source of MSX from which oysters become infected, because of the lack of correlation between disease severity and oyster abundance (Ford and Haskin 1982, Andrews 1984). In addition, spores of H. nelsoni are rarely seen in adult oysters; however, a recent study by Kanaley and Barber (1989) indicates that MSX spores are more common in oyster spat (36% of 234 spat examined June 1988 were in some stage of sporulation). At present, the possibility of a reservoir host for MSX still cannot be ruled out. Hillman (1979) acknowledged the unlikelihood of Teredo spp. being a reservoir host for MSX since few Teredo spp. are found in MSX endemic areas; however, similar spore morphologies and the abundance of the spore stage in infections of Teredo spp. warranted further investigation.

Q.2 How will you identify the organisms in class Scyphozoan? Enlist important characteristics of Scyphozoa.

There are approximately 200 species of Scyphozoans organized into four orders. Familiar scyphozoans include Aurelia (the moon jelly) and Cyanea (the lion's mane jelly). Scyphozoans live in all oceans, from the Arctic to tropical waters. Some inhabit the deep sea, but most live near the coastal waters. Most are motile animals, but members of the order Stauromedusae are sessile.

Scyphozoans exhibit the main characteristics of cnidarians. They have radial symmetry and are diploblastic, meaning that their body wall consists of the outer epidermis (ectoderm) and the inner gastrodermis (endoderm), which are separated by mesoglea. They have nematocysts, which are characteristic of the phylum. They undergo alternation of generations, with the medusa form being dominant. Scyphomedusae are the "jellyfish" with which most people are familiar.

The scyphozoan life cycle varies from order to order. The medusae are gonochoric. Fertilized eggs may be brooded for a time or may develop directly into a free-swimming, ciliated planula larva. A larva metamorphoses into a small polyp termed the scyphistoma. Scyphistomae commonly produce more scyphistomae asexually. Eventually, a scyphistoma becomes a strobila, in which the distal end develops into a medusa-like animal. The strobila may look like a stack of saucers, the saucers being the immature medusae called ephyrae. As formation of the ephyrae is completed, each breaks away and eventually grows into a sexually-reproducing adult medusa.

Scyphozoan polyps and medusae exhibit no cephalization and contain no brain, but in some species, light-sensitive eyespots are located along the bell margin of the medusa.

Scyphozoan medusae differ from those of hydrozoans in lacking a velum. A scyphomedusa locomotes by contracting and relaxing muscles of the bell. Contraction pushes water out, propelling the jelly in jet-like fashion. Surrounding the mouth of members of order Semaeostomeae are four oral arms that trail behind the bell and can reach a length of 40 meters. Nematocysts on the oral arms are used for defense and for capturing prey. Scyphozoans, like all Cnidarians, are all carnivores and some are filter-feeders. Many smaller jellies feed on food particles trapped from the water while larger ones prey on fishes or swimming invertebrates. Members of order Rhizostomeae lack central mouths; rather, each has structures much like the oral arms on which many reduced mouths open. An unusual member of the Rhizostomeae, the tropical jelly Cassiopeia, contains symbiotic dinoflagellates inside its body tissues, and lies upside down in sunny areas so its algae can photosynthesize; it receives most of its energy from the carbohydrates fixed by the algae.

Coloration in some scyphozoans comes from the gonads or other internal structures. The bell of some is deeply pigmented.

Scyphozoans can be a nuisance to humans when they wash up on beaches or if humans come in contact with them in the water. A sting from a jellyfish can be very unpleasant and may even cause death. Scyphozoans can be a nuisance to the fishing industry by clogging nets when they accumulate into shoals or groups, which can be many kilometers long. However, some people eat jellies, which are considered a delicacy. The fossil record for Scyphozoa is poor due to the fact that they are made mostly of water and lack hard parts.

Most species of Scyphozoa have two life-history phases, including the planktonic medusa or jellyfish form, which is most evident in the warm summer months, and an inconspicuous, but longer-lived, bottom-dwelling polyp, which seasonally gives rise to new medusae. Most of the large, often colorful, and conspicuous jellyfish found in coastal waters throughout the world are Scyphozoa.[4] They typically range from 2 to 40 cm (1 to 15+½ in) in diameter, but the largest species, Cyanea capillata can reach 2 metres (6 ft 7 in) across. Scyphomedusae are found throughout the world's oceans, from the surface to great depths; no Scyphozoa occur in freshwater (or on land).

As medusae, they eat a variety of crustaceans and fish, which they capture using stinging cells called nematocysts. The nematocysts are located throughout the tentacles that radiate downward from the edge of the umbrella dome, and also cover the four or eight oral arms that hang down from the central mouth. Some species, however, are instead filter feeders, using their tentacles to strain plankton from the water.

Q.3 What are characteristics of Phylum Ctenophore?

Ctenophores are free-swimming, transparent, jelly-like, soft-bodied, marine animals having biradial symmetry, comb-like ciliary plates for locomotion, the lasso cells but nematocytes are wanting. They are also known as sea walnuts or comb jellies.

- They are free-swimming, marine, solitary, pelagic animals. No polymorphism and no attached stages were found.
- The body is transparent, gelatinous, pear-shaped, cylindrical, or flat or ribbon-shaped.
- They have a biradially symmetrical body along an oral-aboral axis.
- They have an external surface with comb-like 8 ciliary plates for locomotion. Hence name as comb jellies.
- They have a pair of long, solid, retractile tentacles.
- Their body organization is cell-tissue grade.
- Their body is acoelomate and "diploblastic" having ectoderm and endoderm. The body wall has outer epidermis, inner gastrodermis, middle jelly-like mesoglea with scattered cells, and muscle fibers. So, Ctenophora may also be considered as "triploblastic".
- Their digestive system contains the mouth, stomodaeum, complex gastrovascular canals, and 2 aboral anal pores.
- They lack nematocysts.
- They have special adhesive and sensory cells i.e. colloblasts or lasso cells present in tentacles which helps in food captures.
- They lack skeletal, circulatory, respiratory, and excretory organs.
- Their nervous system is diffused types and the aboral end bears a sensory organ, called statocyst.
- They are monoecious (hermaphrodite); gonads are endodermal situated on walls of digestive canals.
- Their development direct with characteristic cydippid larva.
- They lack asexual reproduction and alternation of generation.
- Regeneration and paedogenesis are common in them.

Q.4 identify some important treaded parasites of human. Describe life cycle of Fascoila Hepatica.

Fasciola hepatica, also known as the **common liver fluke** or **sheep liver fluke**, is a parasitic trematode (fluke or flatworm, a type of helminth) of the class Trematoda, phylum Platyhelminthes. It infects the livers of various mammals, including humans, and is transmitted by sheep and cattle to humans the world over. The disease caused by the fluke is called fasciolosis or fascioliasis, which is a type of helminthiasis and has been classified as a neglected tropical disease. Fasciolosis is currently classified as a plant/food-borne trematode infection, often acquired through eating the parasite's metacercariae encysted on plants. F. hepatica, which is distributed worldwide, has been known as an important parasite of sheep and cattle for decades and causes significant economic losses in these livestock species, up to £23 million in the UK alone. Because of its relatively large size and economic importance, it has been the subject of many scientific investigations and may be the best-known of any trematode species. F. hepatica's closest relative is Fasciola gigantica. These two flukes are sister species; they share many morphological features and can mate with each other.

The metacercariae are released from the freshwater snail as cercariae, and form cysts on various surfaces including aquatic vegetation. The mammalian host then eats this vegetation and can become infected. Humans can often acquire these infections through drinking contaminated water and eating freshwater plants such as watercress. Inside the duodenum of the mammalian host, the metacercariae are released from within their cysts. From the duodenum, they burrow through the lining of the intestine and into the peritoneal cavity. They then migrate through the intestines and liver, and into the bile ducts. Inside the bile ducts, they develop into an adult fluke.[9] In humans, the time taken for F. hepatica to mature from metacercariae into an adult fluke is roughly 3 to 4 months. The adult flukes can then produce up to 25,000 eggs per fluke per day.[10] These eggs are passed out via stools and into freshwater. Once in freshwater, the eggs become embryonated, allowing them to hatch as miracidia, which then find a suitable intermediate snail host of the Lymnaeidae family. Inside this snail, the miracidia develop into sporocysts, then to rediae, then to cercariae. The cercariae are released from the snail to form metacercariae and the life cycle begins again.

The outer surface of the fluke is called the tegument. This is composed of scleroprotein, and its primary function is to protect the fluke from the destructive digestive system of the host.[12] Its also used for renewal of the surface plasma membrane and the active uptake of nutrients, and the uptake of some compounds (e.g. taurine) make flukes even more resistant to be killed by the digestive system of host.[13][14] On the surface of the tegument are also small spines. Initially, these spines are single-pointed, then, just prior to the fluke entering the bile ducts, they become multipointed. At the anterior end of the fluke, the spines have between 10 and 15 points, whereas at the posterior end, they have up to 30 points.[15] The tegument is a syncytial epithelium. This means it is made from the fusion of many cells, each containing one nucleus, to produce a multinucleated cell membrane. In the case of F. hepatica, no nuclei are in the outer cytoplasm between the basal and apical membranes. Thus, this region is referred to as anucleate. Instead, the nuclei are found in the cell bodies, also known as tegumental cells, these connect to the outer cytoplasm via thin cytoplasmic strands. The tegumental cells contain the usual cytoplasmic organelles (mitochondria, Golgi bodies, and endoplasmic reticulum).[16] The tegument plays a key role in the fluke's infection of the host. Studies have shown that certain parts of the tegument (in this case, the antigen named Teg) can actually suppress the immune response of the mammalian host. This means that the fluke is able to weaken the immune response, and increase its chances of a successful infection. A successful infection is needed for the fluke to have enough time to develop into an adult and continue its lifecycle.[17]

The alimentary canal of F. hepatica has a single mouth which leads into the blind gut; it has no anus. The mouth is located within the anterior sucker on the ventral side of the fluke. This mouth leads to the pharynx, which is then followed by a narrow oesophagus. The oesophagus, which is lined with a thin layer of epithelial cells, then opens up into the large intestine. As no anus is present, the intestine branches, with each branch ending blindly near the posterior end of the body.[18] Flukes migrate into smaller capillaries and bile ducts when feeding within the host. They use their mouth suckers to pull off and suck up food, bile, lymph, and tissue pieces from the walls of the bile ducts.[18] F. hepatica relies on extracellular digestion which occurs within the intestine of the host. The waste materials are egested through the mouth. The nonwaste matter is adsorbed back in through the tegument and the general surface of the fluke. The tegument facilitates this adsorption by containing many small folds to increase the surface area.

F. hepatica's tegument protects it from the enzymes of the host's digestive system, whilst still allowing water to pass through.[14] Free-swimming larvae have cilia and the cercariae have a muscular tail to help them swim through the aquatic environment and also allow them to reach the plants on which they form a cyst.[29] To attach within the host, F. hepatica has oral suckers and body spines. Their pharynges also help them to suck onto the tissues within the body, particularly within the bile ducts.[31] The adult fluke's respiration is anaerobic; this is ideal, as no oxygen is available in the liver.[19] F. hepatica is adapted to produce a large number of eggs, which increases its chances of survival, as many eggs are destroyed on release into the environment. Also, F. hepatica is hermaphrodite, thus all flukes can produce eggs, increasing the number of offspring produced by the population.

Q.5 Describe external and internal features of phylum kinorhyncha.

They live in the marine mud or in the interstitial spaces of marine sand. They are found in the intertidal zone to the depths of several thousand metres.

The phylum kinorhyncha is divided into two classes:

Class 1. Cyclorhagida:

Body with 14-16 closing plates in the neck region; trunk oval to triangular in cross section with many spines; adhesive tubes present, common in marine muds and sands.

Examples:

Cateria, Echinoderes.

Class 2. Homalorhagida:

Body with 6-8 closing plates in the neck region; trunk spines few and triangular in cross section, common in marine muds.

Examples:

Kinorhynchus, Pycnophyes.

Features of Phylum Kinorhyncha:

1. Phylum Kinorhyncha are microscopic, marine animals.
2. Body length of Phylum Kinorhyncha is less than 1 mm.
3. Short, grub-like, segmented with flattened ventral surface.
4. Body of Phylum Kinorhyncha is covered by an external chitinous divisible cuticle.
5. Body of Phylum Kinorhyncha is divided into 13 segments (zonites) of which 1st segment is the eversible head, 2nd segment is the neck and the trunk includes the rest of 11 segments. The head is retractable into the neck.
6. Cuticle spiny and without motile cilia and forms hard articular segmental plates.
7. A pair of adhesive tubes on the ventral surface of the fourth segment in the males of Pyncnophyes and Kinorhynchus.
8. Head with several rings of curved spines at the base called scalids, serve locomotory and sensory functions and piercing stylets at the tip (Fig. 15.22).
9. Head can be withdrawn into the neck or within the first segment of the trunk.
10. The neck consists of a series of plates called placids (Fig. 15.22).
11. Body cavity of Phylum Kinorhyncha is a fluid-filled reduced pseudocoel or may be absent in some species.
12. Respiratory and circulatory systems are absent in Phylum Kinorhyncha.
13. One pair solenocytic protonephridial excretory system (Fig. 15.22).
14. Circumpharyngeal nerve ring with longitudinal nerve cords.
15. Sexes gonochoristic (sexes separate).
16. Tubular gonads.
17. Fertilization is probably internal in Phylum Kinorhyncha.
18. Periodic moulting occurs.
19. No free-swimming larval stage.