Lecture 4:

Division 2: Eumycota

Class 1: Chytridiomycetes

General characteristics: -

1- Production motile cell –zoospores and planogametes- each with a single, posterior, whiplash flagellum.
2- The chytridiomycetes are more prevalent in aquatic habitats, many of them, however, also inhabit the soil, some of them are parasites.
3- Somatic structures are:
   A- Coenocytes structure.
   B- Multinucleate, globose or oval with or without rhizoid
   C- Well- develops mycelium (in some individuals).

Classification of Class: Chytridiomycetes:

This class was classified into three orders:

Order 1: Chytridiales:

General characteristics: -

1- The organisms which included in this order are unicellular, globose, with or without rhizoid and holocarpic.

2- Water or soil inhabiting species, many of them former parasitic on algae and water mold, many of the later on vascular plants.

3- There are only a few economically important parasites in the entire order. *Synchytrium endibioticum* causes the disease known as Potato wart -Black wart disease on Potato-. Figure 14.

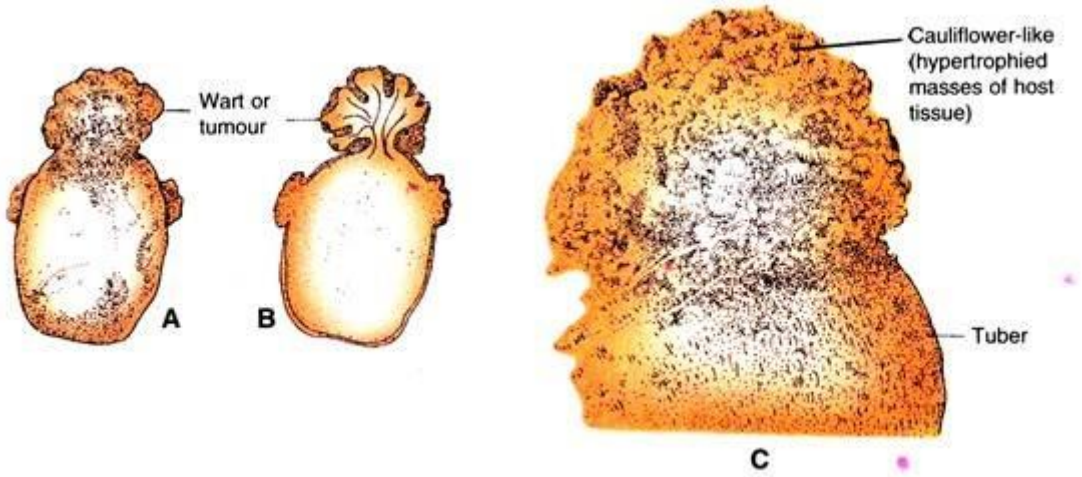

Figure 14: - Black wart of Potato

Life cycle of *Synchytrium endobioticum:*

The fungus causes hypertrophy and hyperplasia of the surface cell layers of the infected Potato tubers; which contain **resting sporangia**. *

When the warts lyses, the resting sporangia are release in soil, and then the **zoospores** are released when the conditions are suitable*. The zoospores are penetrating into the host through the root hairs, then the zoospore increase in size and produce two layers chitinous wall around it self to form **prosorus**.* The fungus- parasite- increase in size, and mitosis is started to give 32 nuclei, then cytoplasmic septa are formed to form 4-9 sporangia in one sac –**Sorus**.* The mitosis is continuous to give 100-300 nuclei in each sac, each nuclei will be converting to zoospore in the presence of water. * The zoospore can penetrate the host again. * -Asexual cycle-

Sexual cycle will be started in: ???

Lacking the water at a certain period in the development of the fungus affords a maturation of gametes. * These gametes are union in pairs to form zygote, which can penetrate the host cell. * The parasite will increase in size and converting to resting sporangium, then the nucleus is undergoing division to give zoospores. Figure 15.

Note: It is considered that, meiosis is occurring during zoospore formation.

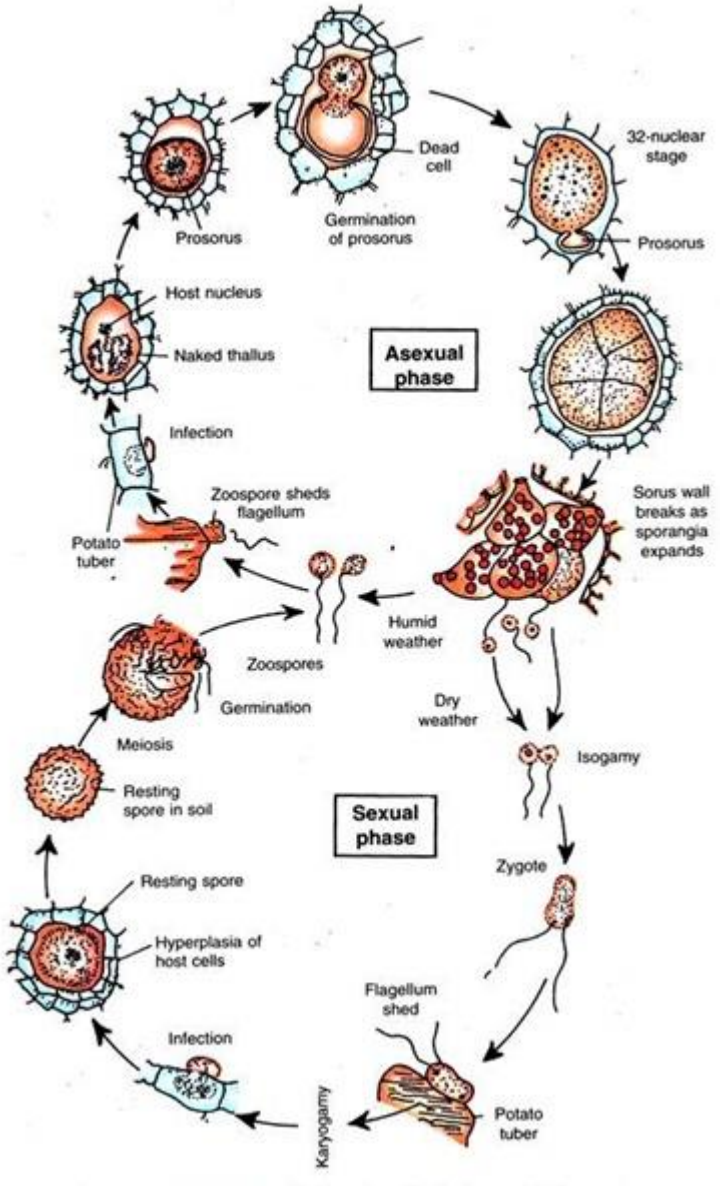

Figure 15: Life cycle of *Synchytrium endobioticum*

Order 2: Blastocladiales

General characteristics: -

1- Most of them are saprobes on animals and plants debris.

2- Vegetative structure is Eucarpic.

3- Somatic structure consists of basal cell with rhizoid and bearing one sporangium or more.

Family: - Blastocladiaceae

Genus: *Allomyces*

Life cycle of *Allomyces*:-

Species of the genus *Allomyces* exhibit a definite **alternation of generations**, haploid gametothallus alternating with diploid sporothallus.*The gametothalli produce colorless female gametangia and orange male gametangia usually in a 1:1 ratio.*The male gametangia are smaller than female and borne on the later such as in *A. macrogynus* or below them such as in *A. arbuscula*.*Both types of gametangia release motile gametes, the gametes are posterior uniflagellate, copulation then occurs to give zygote.* Zygote enlarges and gives rise to the first hyphal tube, which elongates, branched dichotomously, and develops into a diploid sporothallus.*At maturity, the sporothalli form two types of sporangia; thin walled, elongated, colorless zoosporangia – Mitosporangia, and thick-walled, pitted, resistant sporangia –Meiosporangi -resting sporangia- that contain melanin pigments and appear reddish brown.* The zoosporngia germinate soon after their formation, releasing diploid zoospores –mitospores- that swim about for a time, encysted and give rise to sporothalli, thus repeating the diploid generation.* The resistant sporangia- Meiosporangia- require a rest of 2-8 weeks or more before they germinate.*Meiosis in the resistant sporangia takes place at the time of germination to form haploid zoospores; that are slightly smaller than the diploid. * Then meiospores being haploid give rise to gametothalli, which produce gametangia instead of sporangia Figure 16.

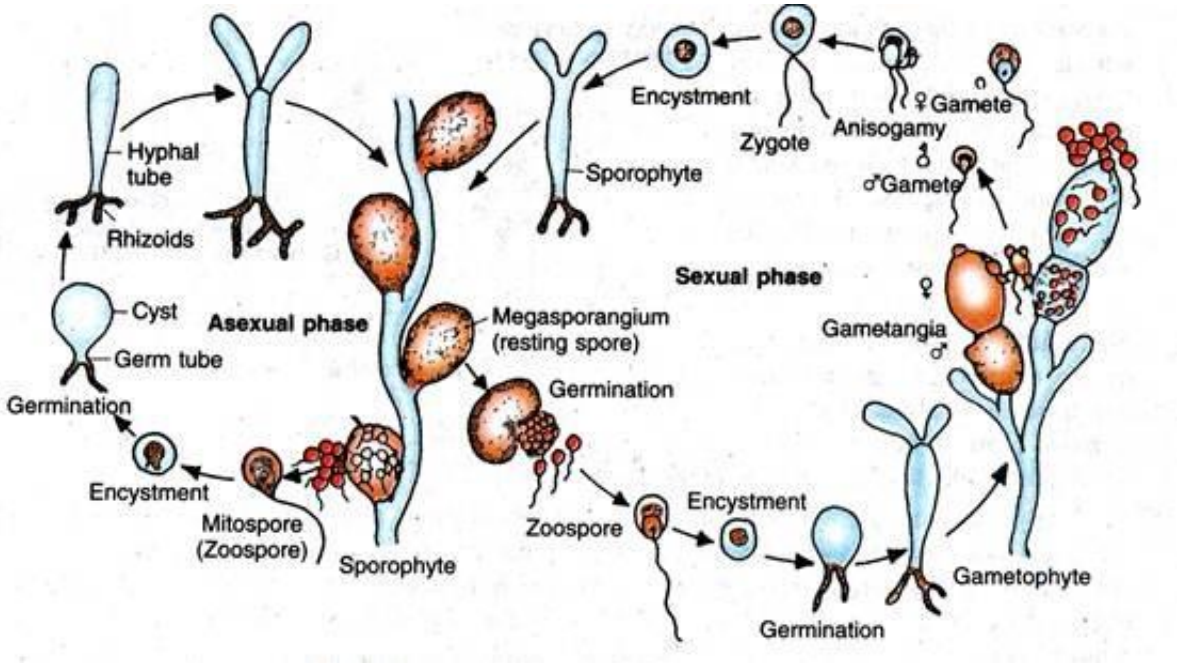

Figure 16: Life cycle of *Allomyces macrogynus*

Order 3: Monoblepharidales

Family: Monoblepharidaceae

Genus: *Monoblepharis*

<u>Life cycle of *Monoblepharis polymorpha:*</u>

The somatic thallus consists of hyphae whose protoplasm which is highly vacuolated, appears foamy. Elongated sporangia are borne singly at the hyphal tips. * They are generally no larger in diameter than the somatic hypha. * The sporangia are subtended by a septum, multinucleate from the first, the sporangial protoplast becomes divided into many uninucleate portions, each of which develops into a posterior uniflagellate zoospore. * The zoospores are released from the tip of sporangium, swim for a time, become rounded, and germinate, each by a germ tube, forming a new mycelium –Asexual cycle-. *The same thallus that produces the sporangia produces gametangia –male and female-.*The male is the narrow elongated antheridia being borne on the rounded, large

oogonia.* A number of uniflagellate gametes, called antherozoids, are formed within and released from each antheridium.*The protoplast of the oogonium becomes rounded and forms uninucleate oospore.* After the antherozoids are released from antheridia, they swim or creep over the oogonia.* A single sperm enters the oogonium through a papilla present in the oogonial wall, penetrates the oosphere to give fertilized egg.* The fertilize egg soon emerges from the oogonium, and while still attached to the oogonial wall, secretes a thick wall around it self and develops into oospore.*Karyogamy is delayed until the oospore wall is partially formed, the oospore germinate under favorable conditions by producing a hypha that develops into new thallus.* Meiosis probably takes place during the germination of the oospore, when the zygote nucleus first divides. Figure 17.

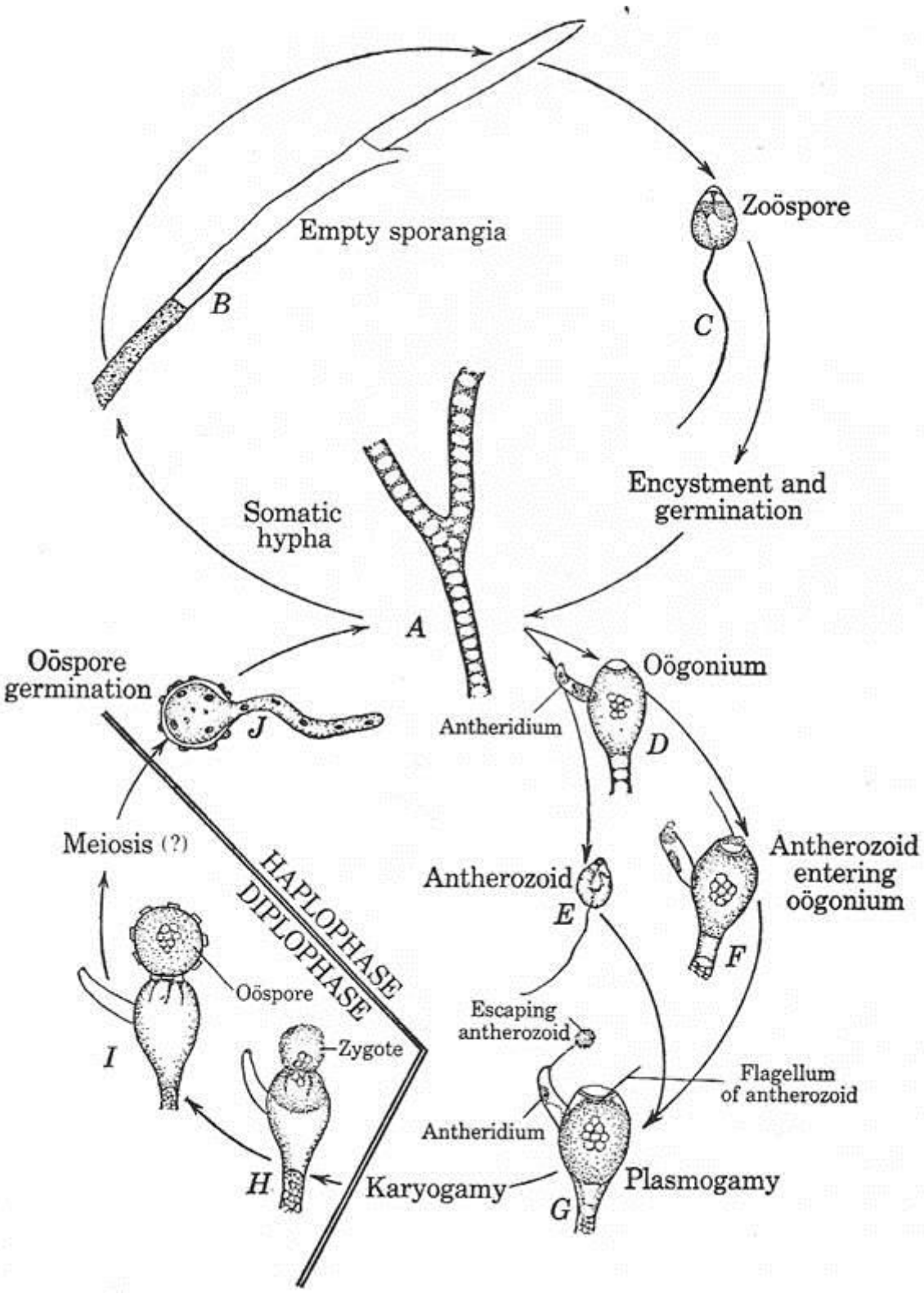

Figure 17**: - Life cycle of *Monoblepharis polymorpha***

Class 2: Hypochytridiomycetes:

-The hypochytridiomycetes, are aquatic, fresh-water or marine chytrid-like fungi whose motile cells are anterior uniflagellate, with a tinsel type flagellum.

- They are parasitic on algae and fungi or saprobic on plant and insect debris in the water in which they live.

- All are included in the single order hypochytridiales.

-Ex: *Rhizidiomyes*