Medical Analysis Department
Faculty of Science

Slime Molds and Water Molds

Course_ Mycology (theory)
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The slime molds and water molds

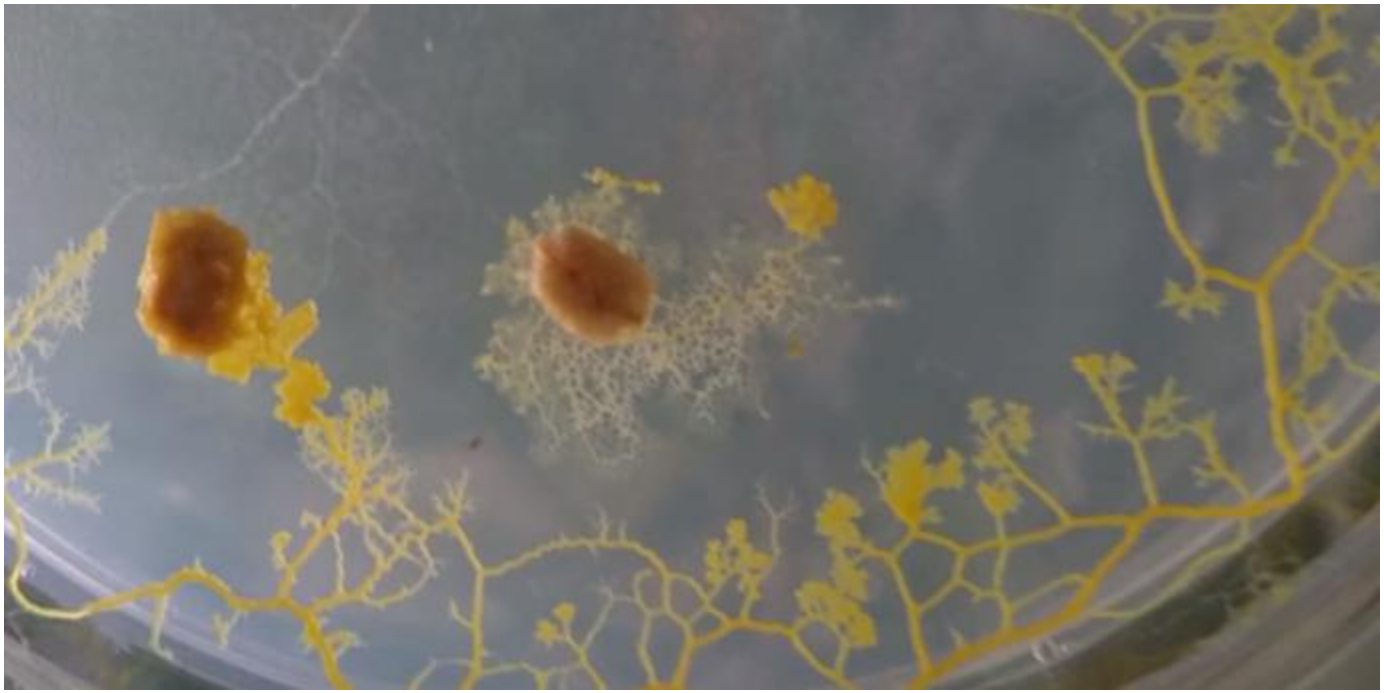
The slime molds and water molds resemble fungi in only appearance and life-style. In their cellular organization, reproduction, and life cycles, they are phylogenetically distinct

Division Myxomycota (Acellular Slime Molds)

Under appropriate conditions plasmodial (acellular or true) slime molds exist as streaming masses of colorful protoplasm that creep along in an amoeboid fashion over moist, rotting logs, leaves, and other organic matter. Feeding is by phagocytosis.

Plasmodium of the slime mold Physarum

A distinguishing morphological difference between the two groups is the vegetative state of cellular slime molds in a haploid amebiod cell, whereas the vegetative state of acellular slime molds is a multinucleate diploid ameboid mass called a plasmodium. Both groups grow in moist soil or decaying plant matter and are white, yellow, or red in color.

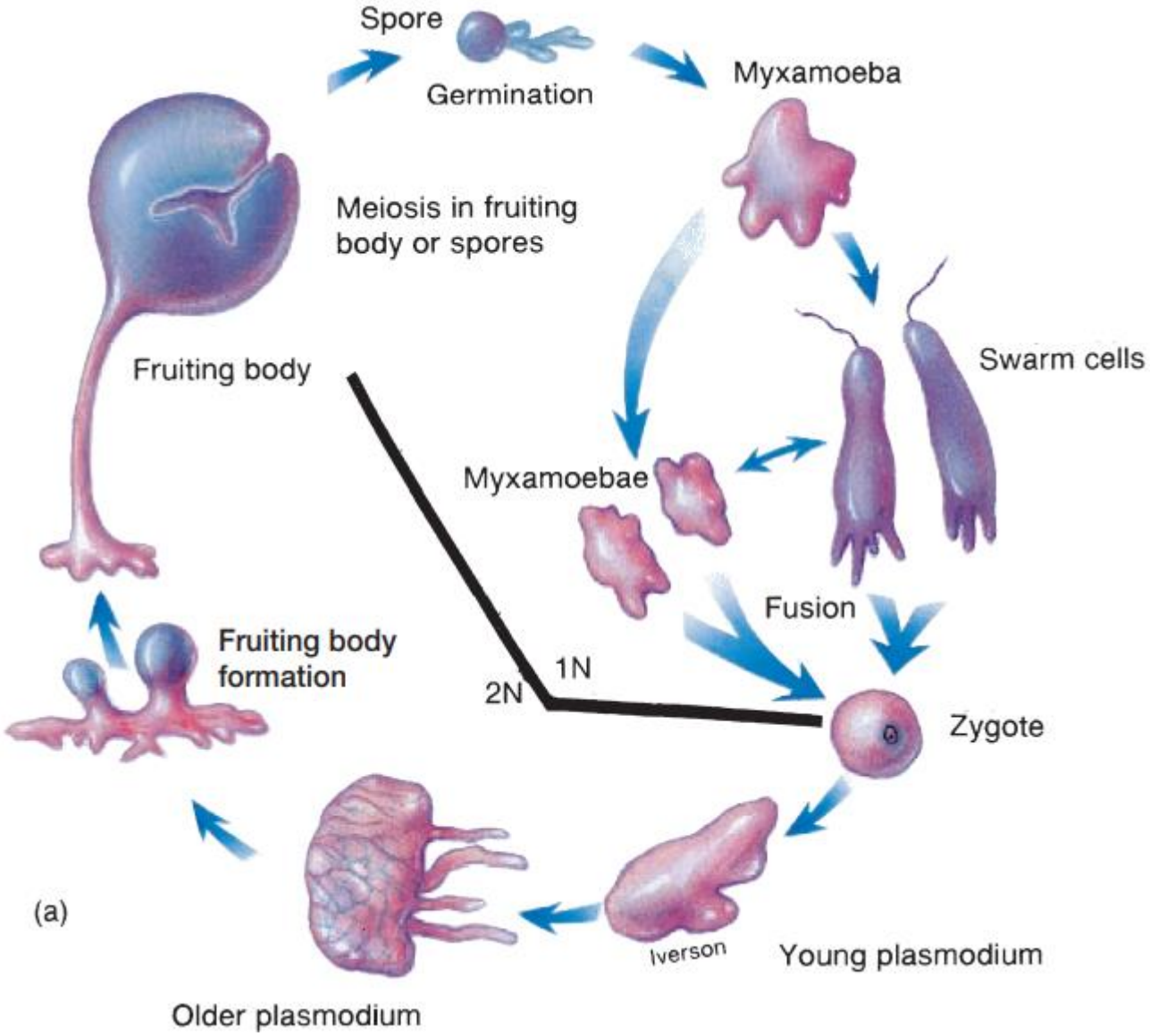


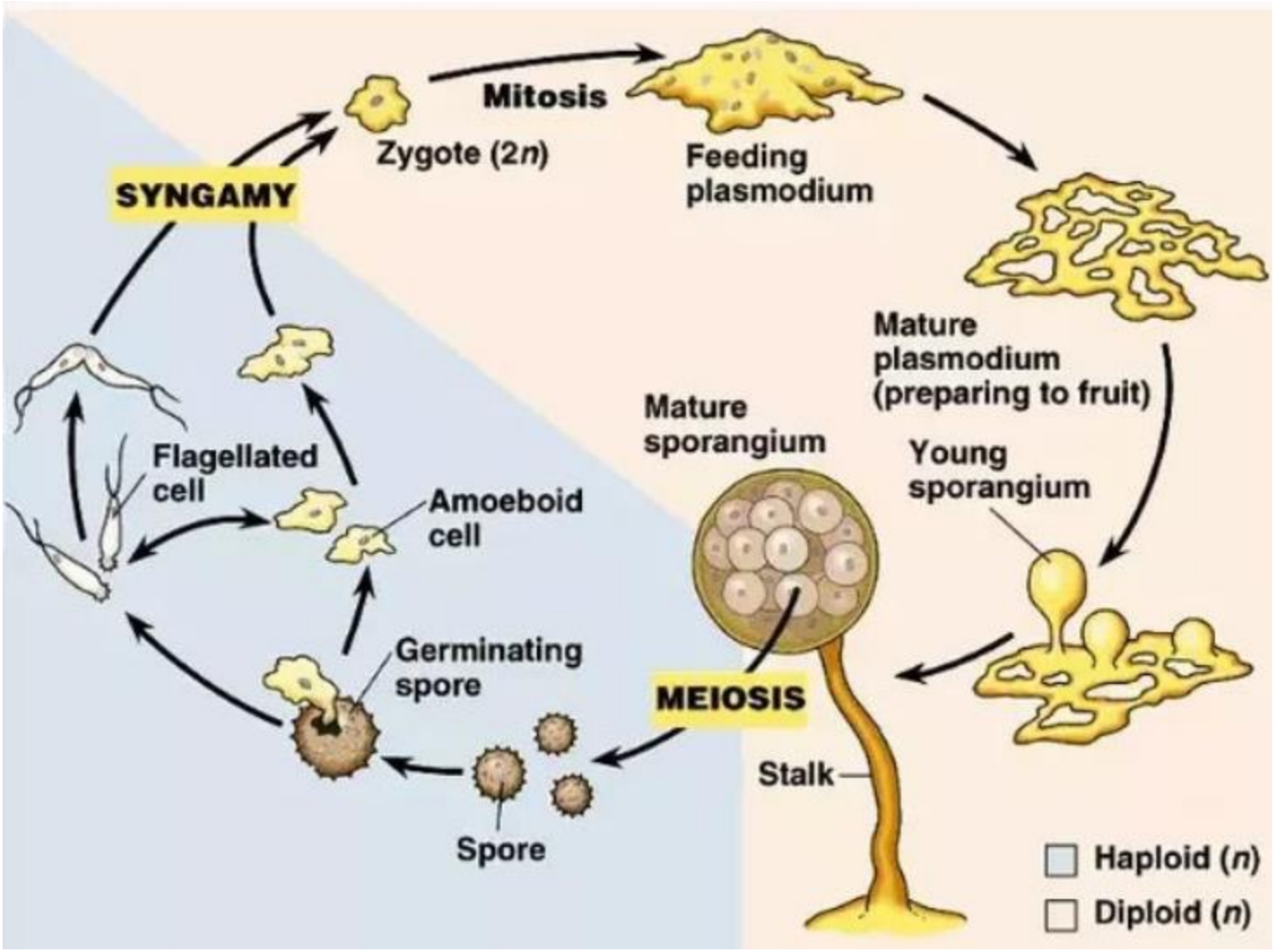
because this streaming mass lacks cell walls, it is called a plasmodium. The plasmodium contains many nuclei, and as the organism grows, the diploid nuclei divide repeatedly.

The plasmodium phase of the acellular slime molds differs from the pseudoplasmodium of the cellular slime molds in that it is diploid. This mass gives rise to a fruiting body in which meiosis occurs and haploid spores are produced. The spores germinate to produce flagellated gametes. These gametes fuse to form a diploid zygote. The zygote grows and its nucleus divides mitotically, but the cytoplasm does not divide, resulting in another plasmodium.

When the plasmodium matures or when food and/or moisture are scarce, it moves into a lighted area and develops delicate fruiting bodies. As the fruiting bodies mature, they form spores with cellulose walls that are resistant to environmental extremes. The spores germinate in the presence of adequate moisture to release either non-flagellated amoeboid myxamoebae or flagellated swarm cells.

The life cycle of a plasmodial slime mold (Myxomycota)




Mitosis
Zygote (2n)
Feeding plasmodium
SYNGAMY
Mature plasmodium (preparing to fruit)
Mature sporangium
Young sporangium
Flagellated cell
Amoeboid cell
Germinating spore
MEIOSIS
Stalk
Spore
Haploid (n)
Diploid (n)

Plasmodial slime-mold fruiting bodies

Initially the myxamoebae or swarm cells feed and are haploid eventually they fuse to form a diploid zygote. The zygote feeds, grows, and multiplies its nuclei through synchronous mitotic division to form the multinucleate plasmodium

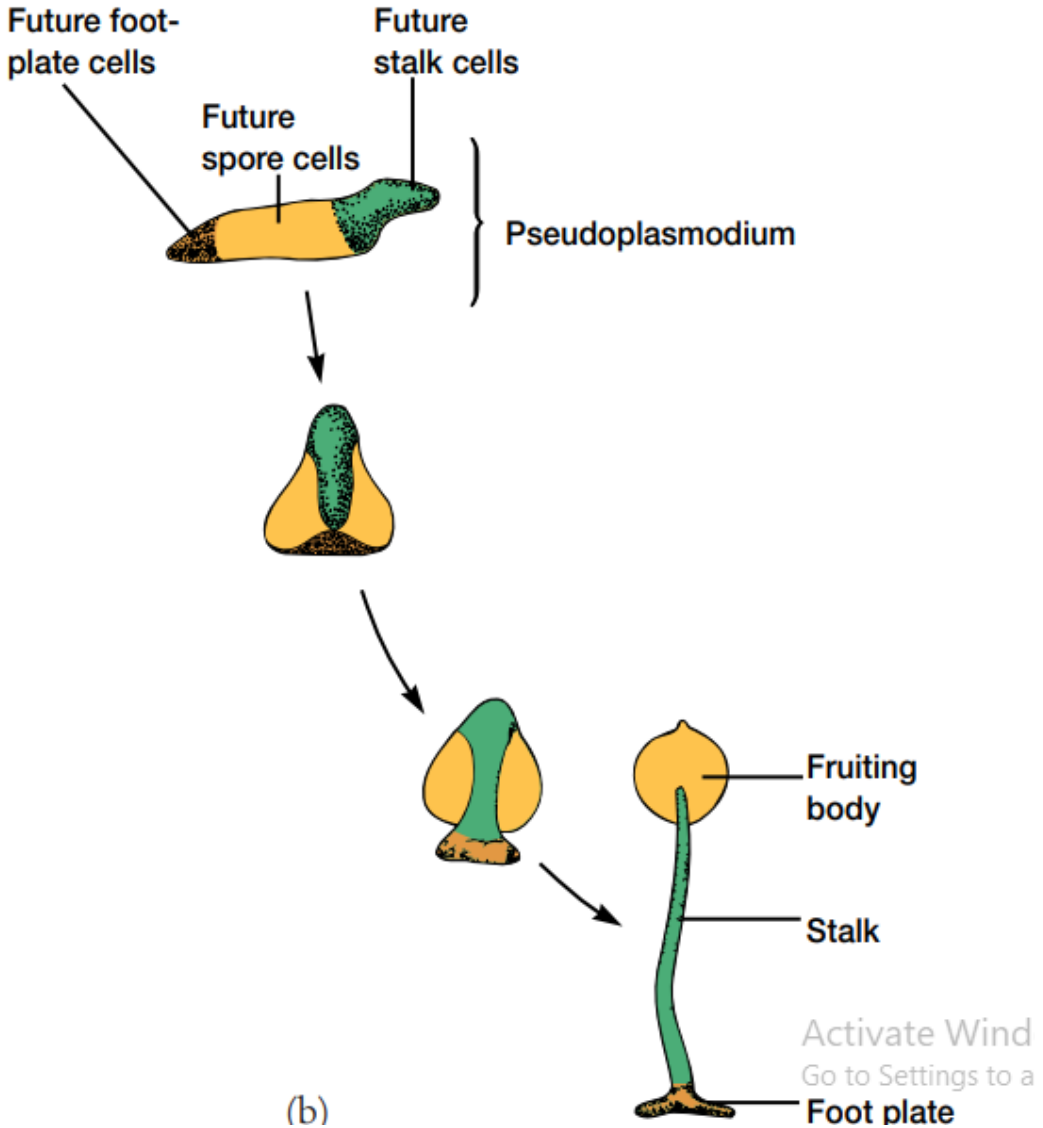
Division Acrasiomycota (Cellular Slime Molds)

The vegetative stage of cellular slime molds consists of individual amoeboid cells termed myxamoebae. The myxamoebae feed phagocytically on bacteria and yeasts. When food is plentiful, they divide repeatedly by mitosis and cytokinesis, producing new daughter myxamoebae.

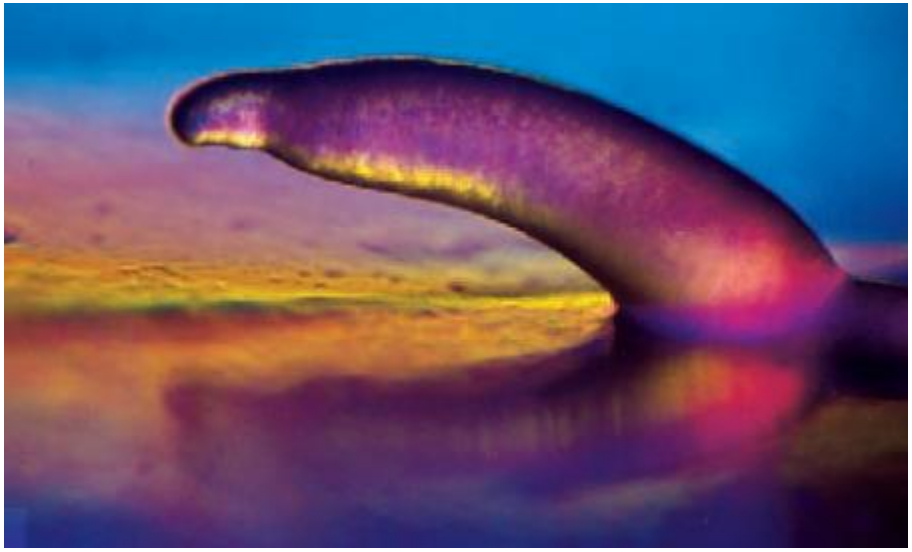
Aggregating myxamoebae become polar and begin to move in an oriented direction due to the influence of cAMP

Sexual reproduction is most likely to take place in very damp conditions. In drier conditions, cellular slime molds enter an asexual reproductive phase. When the haploid individual myxamoebae aggregate they form a slug-like pseudoplasmodium. From this forms a stalked fruiting body. In this fruiting body spores will be produced and released.

Diagrammatic drawing of cell migration involved in the formation of the sorocarp

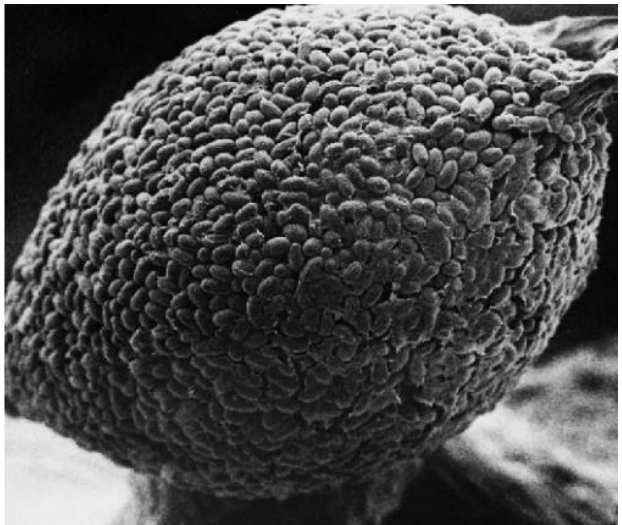


(A)an initial pseudoplasmodium. (B) Light micrograph of A mature fruiting body (sorocarp). (C) Electron micrograph of a sorus showing spores



A

B

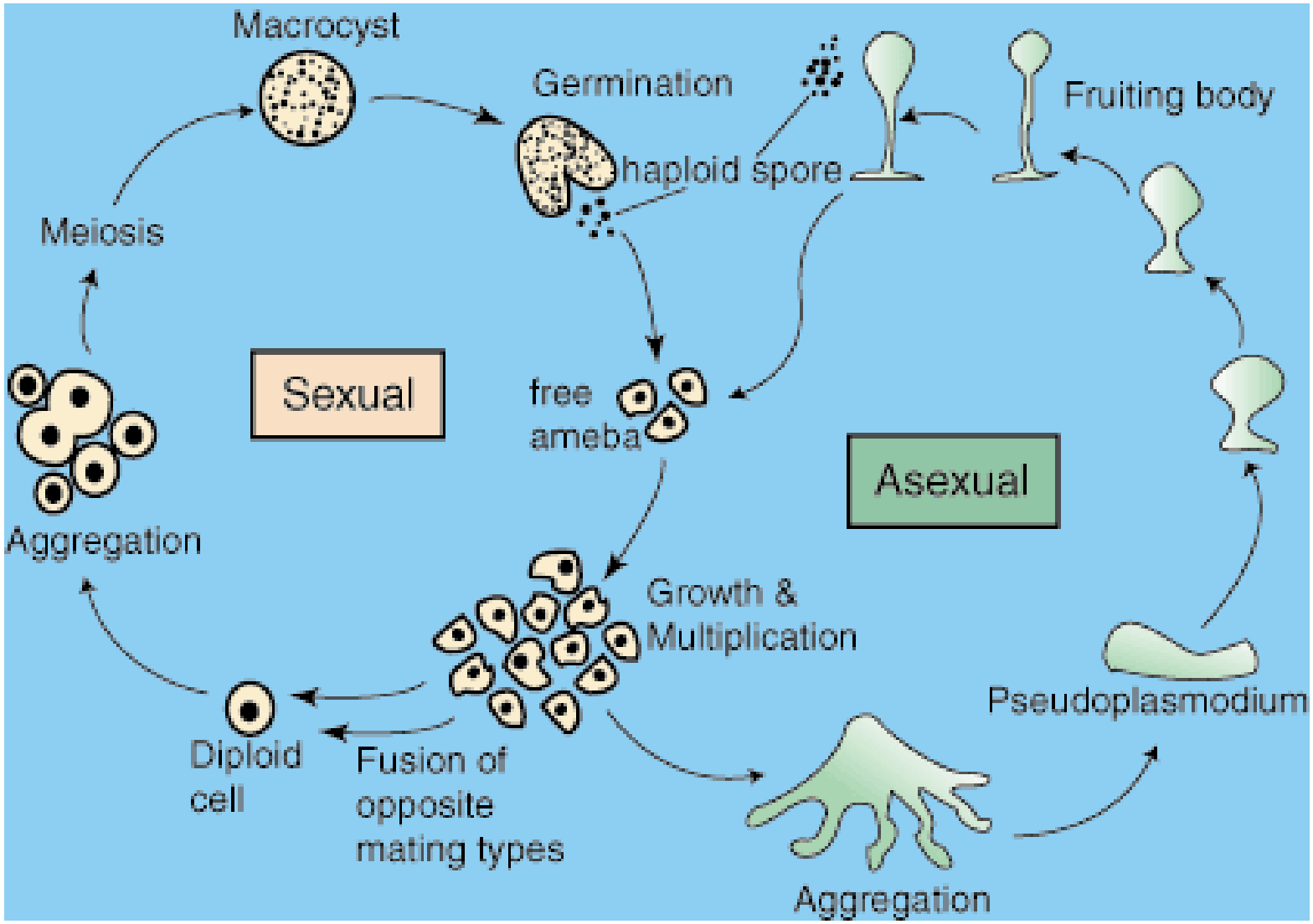


C

Reproduction in cellular slime mold

the vegetative phase of the cellular slime molds is an ameboid cell. Depending on environmental conditions, these cells will enter either the sexual or the asexual reproductive phase. For sexual reproduction, two cells of opposite mating types fuse to create a diploid cell. As other ameboid cells reach this cell, they are phagocytized and a giant cell forms. This cell undergoes meiosis and becomes a macrocyst. Spore formation takes place inside the macrocyst, from where the resulting haploid spores will be released.

Reproduction Cellular Slime Molds



The pseudoplasmodium may move around as a unit for a while, leaving a slime trail,

but it eventually becomes sedentary (inactive).

In the asexual phase, pseudoplasmodial cells begin to differentiate into pre-stalk cells and pre-spore cells.

A fruiting body called a sorocarp forms and matures and then produces walled spores. The spores are eventually released, and when conditions become favorable, they germinate to release haploid amoebae and repeat the cycle.

Acellular Slime-Moulds :

1. Somatic phase diploid (2n).
2. It is represented by large sized multinu- cleate plasmodium.
3. No aggregation takes place prior to formation of sporangia.
4. Sporangium covered (by peridium).
5. Capitalum found in-side the sporangium.
6. Meiosis occurs inside spores.

Cellular Slime Moulds :

1. Somatic phase haploid (n).
2. It is represented by uni-nucleate amoeboid cells the myxamoebae.
3. These aggregate to produce a pseudoplasmo- dium prior to formation of sporangia.
4. Sporangium naked.
5. Capitalum is absent.
6. Spores are haploid (n).

Division Oomycota

Members of the division Oomycota are collectively known as oomycetes or water molds. Oomycetes resemble true fungi only in appearance, consisting of finely branched filaments called hyphae. However, oomycetes have cell walls of cellulose, whereas the walls of most fungi are made of chitin. Oomycetes are also unlike the true fungi in that they have tubular mitochondrial cristae.

Oomycota means “egg fungi,” a reference to the mode of sexual reproduction in water molds. A relatively large egg cell (oogonium) is fertilized by either a sperm cell or a smaller antheridium to produce a zygote. When the zygote germinates, it forms asexual zoospores that bear flagella.

Water molds such as Saprolegnia and Achlya are saprophytes that grow as cottony masses on dead algae and small animals, mainly in freshwater environments. They are important decomposers in aquatic ecosystems. Some water molds are parasitic on the gills of fish. The water mold Peronospora hyoscyami is currently responsible for the troublesome "blue mold" of tobacco plants throughout the world.

In the United States alone, blue mold produces millions of dollars of damage yearly to tobacco crops. Other oomycetes cause late blight of potatoes (*Phytophthora infestans*) and grape downy mildew (*Plasmopara viticola*).

Thank you