Dictyosteliomycota, Acrasiomycota, Labyrinthulomycota and Plasmodiophoromycota.

Phylum Dictyosteliomycota

Dictyostelids are soil organisms, whereas **Acrasids** occur on dead plant parts, tree bark, dung and soil

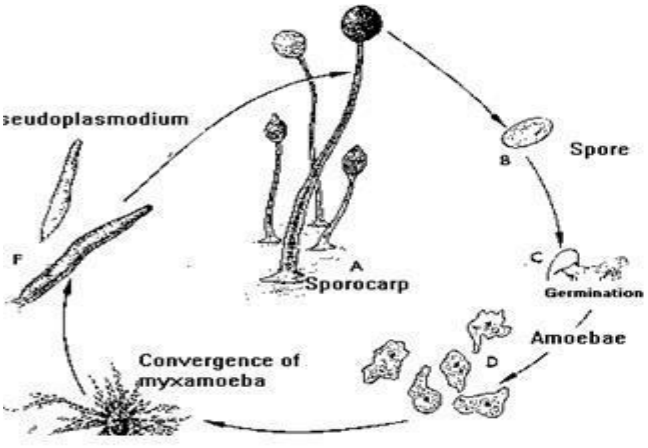
Three genera, 50 species

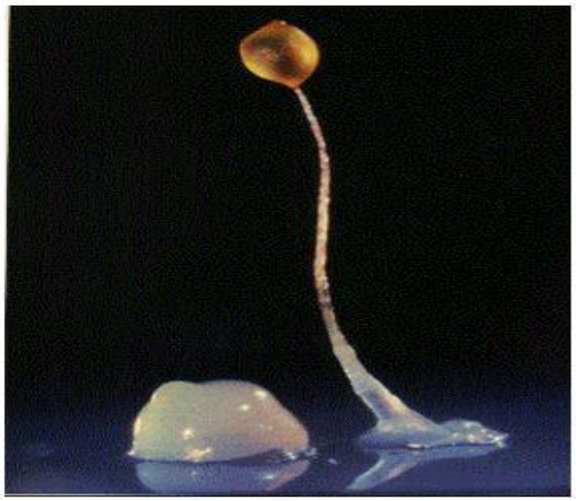
First discovered in 1869 by Oskar Brefeld Genera:

Dictyostelium —

o cells trapped in stalk, stalk unbranched or sparingly branched. Isolated by Kenneth Raper (1935), important model organism for study of cytokinesis, signalling, chemotaxis, phagocytosis, motility, cell sorting, cell-type determination

Polyspondylium—cells trapped in stalk, stalk branched, with branches occurring in whorls





- Dictyostelium life cycle

- Culmination results in formation of sorocarp

Phylum Acrasiomycota

Three families, 5 genera, 15 species

This phylum is probably polyphyletic; both flagellate and non-flagellate families occur, and one family has tubular mitochondrial cristae versus .platelike cristae in the other families

- Primarily associated with plant material
- Lobose pseudopodia on myxamoebae
- Biflagellate cells in some taxa
- All cells of sorocarp able to germinate
- No known sexual reproduction

:Isolation

Acrasis rosea can be isolated from attached dead plant parts, species of *Guttulinopsis* and *Copromyxa* occur on animal dung, and *Pocheina* .species on dead wood and bark of live trees

.**Phylum: Plasmodiophoromycota**

□ Endoparasitic slime molds

□ Trophic stage formed inside host cells

□ Obligate endoparasites of aquatic and terrestrial plants, algae and fungi

□ 46 species in 16 genera

□ Genera based on arrangement of cysts inside host cells

□ Cause abnormal enlargement of host cells (hypertrophy) or abnormal multiplication of cells (hyperplasia); may also cause stunting

Plasmodiophora brassicae—club root of crucifers

Life cycle

: □ Infection initiated by biflagellate zoospores

□ Encysted cell forms short germ tube and attaches to host cell wall by appressorium

□ Encysted cell differentiates into tube like Rohr, with bullet-like satchel

□ Parasite cytoplasm is rapidly injected into host cell

□ Plasmodium develops in host cell by a process involving cruciform nuclear division

□ Plasmodium develops in host cell with cruciform nuclear divisions, intracellular plasmodium develops into either multilobed sporangium (mitotic process) or cystosorus (meiosis). Zoospores or cysts released from host cell

Powdery scab, is a disease of potato tubers. It is caused by the *Spongospora subterranea* f. sp. *subterranea* and is widespread in potato growing countries. Symptoms of powdery scab include small lesions in

the early stages of the disease, progressing to raised pustules containing a powdery mass. The powdery pustules contain resting spores, which release zoospores which can infect the root hairs of potatoes or tomatoes

Oomycota-

- Kingdom Fungi

□ Phylum Chytridiomycota
□ Kingdom Straminipila
□ Phylum Oomycota
□ Phylum Hyphochytriomycota
□ Phylum Labyrinthulomycota

- Protista

□ Phylum Plasmodiophoromycota
□ Phylum Myxomycota

Zoospore

- Microscopic (2-14 x 2-6 micron), uninucleate, unicellular, flagellated spore lacking a cell wall
- Formed in a zoosporangium by a process involving mitosis and cytoplasmic cleavage
- Zoospores do not feed, and rely on endogenous energy reserves

Flagella (sing. flagellum)

1. 0.25 microns wide, up to 50 microns long
2. Composed of a 9(2) + 2 arrangement of microtubules enclosed in a plasma membrane
3. One to many flagella depending on the taxonomic group
4. Two types of flagella:

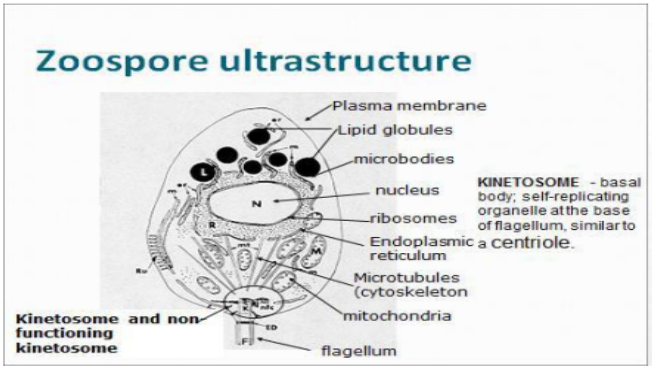
- Whiplash

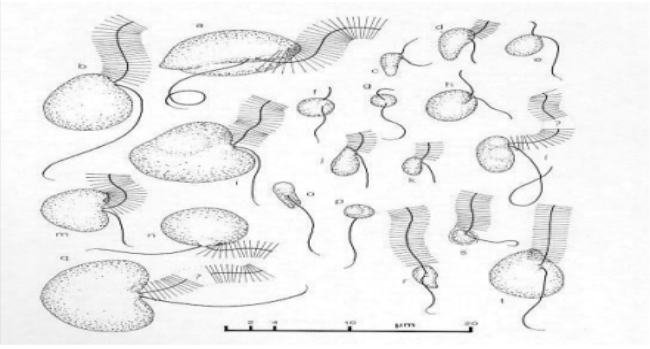
Smooth, usually directed backwards, propels the zoospore

- Tinsel

With tripartite hairs directed forward, pulls the zoospore

5. May have only whiplash, whiplash + tinsel, or only tinsel
6. Flagellum may be of unequal length





1-Encystment

:Prior to germination, zoospores must

□ shed or retract flagella □ Form a cell wall

2-Germination

□ Direct

Formation of germ tube

□ Indirect

Formation of another zoospore

3-Zoosporangium .

1-A typically multinucleate structure that produces zoospores by a . process call zoosporogenesis

□ Zoosporogenesis involves mitosis and cleavage of zoospores from zoosporangium cytoplasm

2- Zoospores release .

□ Breakdown of zoosporangial wall □ Opening of cap-like cover called operculum □ Discharge papillae plugged with gelatinous material

3-Thallus Types

a. Holocarpic

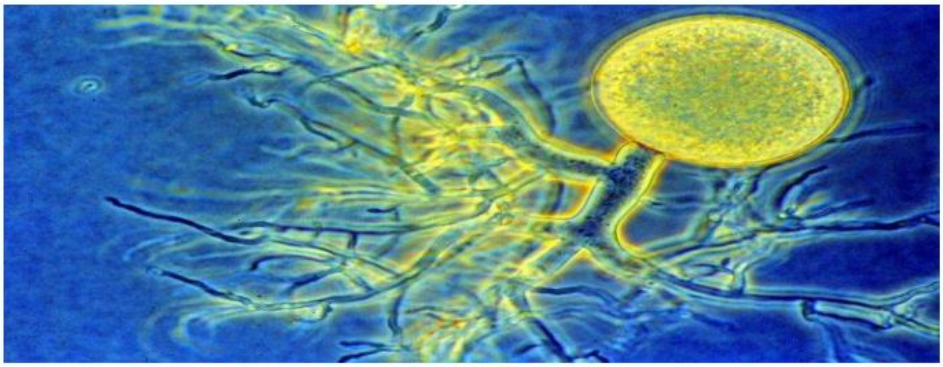
□ Conversion of entire thallus into one (monocentric) or more (polycentric) zoosporangia

b. Eucarpic

□ Entire thallus not converted into zoosporangium, and other structures :may be formed

i. Rhizomycelium—hyphal-like structures connecting sporangia, lack nuclei

ii. Rhizoids—root-like structures, lack nuclei iii. Mycelium



Eucarpic thallus of Spizellomyces

Thallus types relative to substrate

a. Endobiotic
   Thallus produced inside host or substrateb.
b. Epibiotic
   Thallus produced outside host or substrate; rhizoids anchor thallus to substrate

General characteristics of Oomycetes:

Stramenopilous Fungi

• Tinsel flagellum • Tubular mitochondrial cristae • Cellulose in cell walls • Lysine synthesis by diaminiopimelic acid pathway (DAP)

1 class (Oomycetes), 8 orders, 92 genera and 800 species

• Orders to cover:

– **Leptomitales** • Filamentous thallus with cellulin plugs
– **Rhipidiales** • Inflated, branched thallus with cellulin plugs
– **Saprolegniales** • Holocarpic or eucarpic/filamentous
– **Lagenidiales** • Holocarpic
– **Pythiales** • Filamentous thallus
– **Peronosporales** • Filamentous thallus

Characters

• Predominantly diploid life cycle with gametangial meiosis
• Oogamous sexual reproduction:
– Gametangia = oogonia and antheridia
– Thick-walled, resistant oospore formed inside oogonium from oosphere

• Asexual reproduction by heterokont zoospores with tinsel + whiplash flagella

• Cell walls composed primarily of beta-glucans with small amounts of cellulose

• Filamentous species generally produce coenocytic hyphae

• Principle storage compounds are water-soluble mycolaminarins (betaglucans)

• Haustoria formed by plant parasitic species

Zoospores

• Primary zoospores – First formed – Pip-shaped – Flagella emerging from anterior – Poor swimmers, encyst readily

• Secondary zoospores – Reniform or bean-shaped – Flagella emerging from lateral groove

• **Dimorphic**

– Primary and secondary zoospores present in life cycle

• Primary zoospores formed in zoosporangium

• Secondary zoospores formed upon germination of primary zoospores

• Monomorphic

– Secondary-type of zoospores formed inside zoosporangium

Sexual Reproduction

• Mostly heterogametic (morphologically differentiated gametangia):

– Hyphal-like antheridia

• Attracted to oogonium by hormones and develop fertilization tubes

– Large, globose oogonia

• One or more oospores in oogonium

• Simultaneous meiotic divisions occur in antheridia and oogonia prior to fertilization

• Karyogamy occurs in oosphere to form oospore that matures inside oogonium

Oogonia & Oospores

• Oospore wall consists of 3 parts:

– Exospore – Epispore – Endospore

• Periplasm = residual protoplasm

– Plerotic = periplasm present

– Aplerotic = lacking periplasm

Oogonium & Antheridium

• Hypogynous – Antheridium formed in oogonial stalk • Paragynous

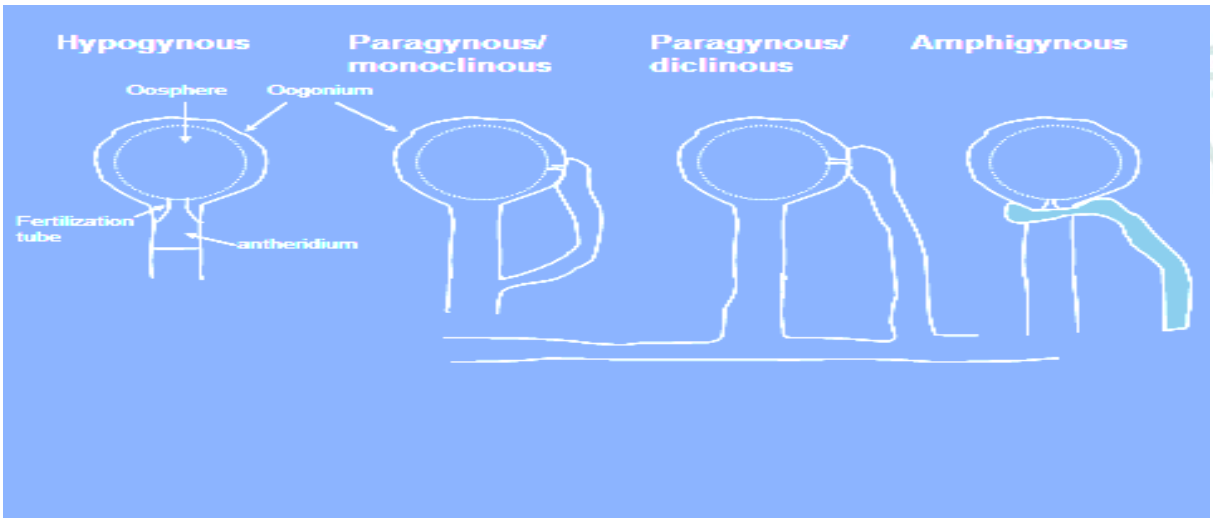
– Antheridium attaches laterally to oogonium

• Monoclinous—branch off oogonial stalk

• Diclinous—branch off separate hypha

• Amphigynous

– Oogonium grows through antheridium



Order Leptomitales

• Mostly aquatic, saprotrophic

Filamentous thallus with regular constrictions plugged by chitinous material called cellulin granules

• Asexual reproduction by elongated, hyphal-like zoosporangia

• Some species form primary and secondary zoospores

Apodachlyal

Order Rhipidiales

• Strictly aquatic, saprotrophic, commonly in stagnant and polluted water

• Thallus:

– Inflated and branched – Attached to substrate by rhizoids – Oogonia, antheridia and zoosporangia formed terminally – Branches and reproductive organs constricted at base and plugged with cellulin granules

• Only secondary zoospores formed

• Strong tendency towards fermentative metabolism

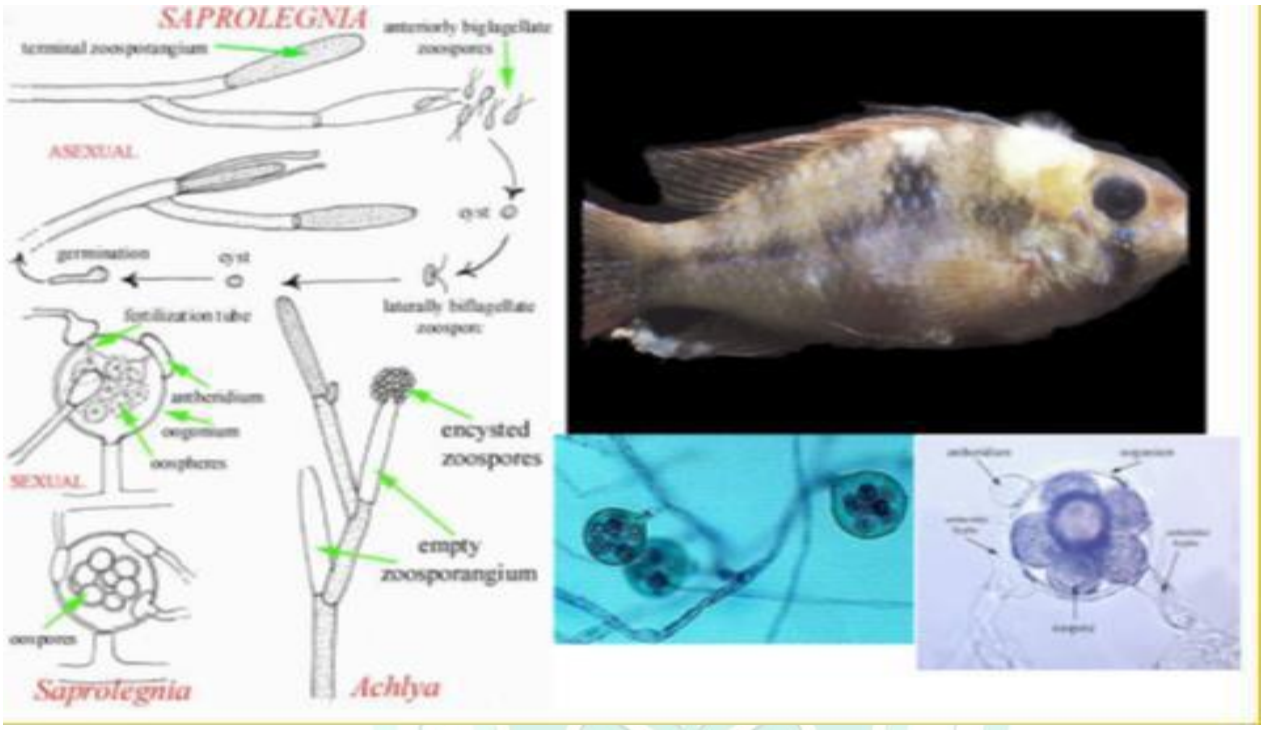
Order Saprolegniales

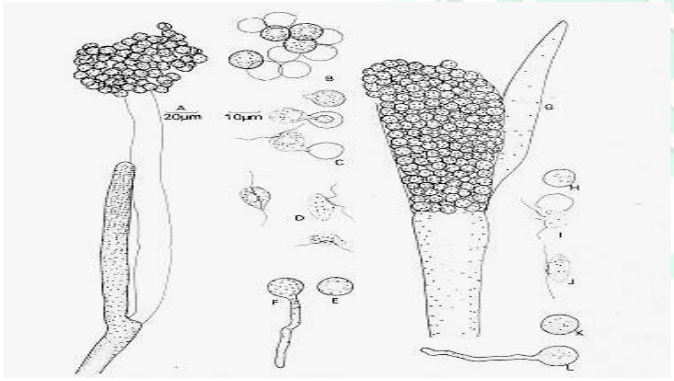
Saprotrophs (fresh water and soil), or parasites (plants and animals (• **Aphanomyces--sugar beets, peas, radishes, aquarium plants – *Achlya, Aphanomyces* and *Saprolegnia*—fish, crustaceans –**

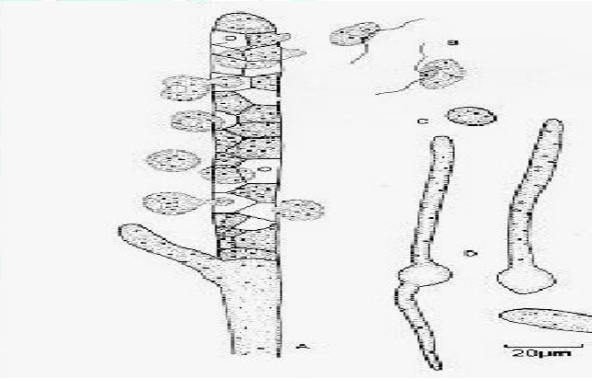
Primary and secondary zoospores -Water mold" applies to this group formed - Filamentous thallus, abundantly branched Oogonia with multiple oospores

***Saprolegnia* sp.**

Members of this genus are parasites on fresh water fish, and fish eggs. Reproduction is mainly asexual. Certain types of hyphae become modified into long zoosporangia delimited by septa. Biflagellate zoospores released from a zoosporangium swim for a while and then encyst. Each eventually gives rise to a secondary zoospore, which also encysts and then germinates to produce a new mycelium. For the purpose of sexual reproduction, compatible oogonia and antheridia develop on the same diploid mycelium. Meiosis apparently occurs within these gametangia.







Achlya ***Dictyuchus***