Biology of Fungi

The Diversity of Fungi and Fungus-Like Organisms

Terms You Should Understand

- 'Fungus' (pl., fungi) is a taxonomic term and does not refer to morphology
- 'Mold' is a morphological term referring to a filamentous (multicellular) condition
- 'Mildew' is a term that refers to a particular type of mold
- 'Yeast' is a morphological term referring to a unicellular condition

Special Lecture Notes on Fungal Taxonomy

- Fungal taxonomy is constantly in flux
- Not one taxonomic scheme will be agreed upon by all mycologists
- Classical fungal taxonomy was based primarily upon morphological features
- Contemporary fungal taxonomy is based upon phylogenetic relationships

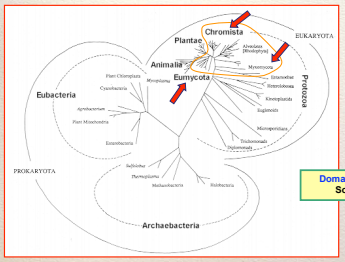
Fungi in a Broad Sense

- Mycologists have traditionally studied a diverse number of organisms, many not true fungi, but fungal-like in their appearance, physiology, or life style
- At one point, these fungal-like microbes included the Actinomycetes, due to their filamentous growth patterns, but today are known as Gram-positive bacteria

Fungi in a Broad Sense (cont.)

- The types of organisms mycologists have traditionally studied are now divided based upon phylogenetic relationships
- These relationships are:
  - Kingdom Fungi - true fungi
  - Kingdom Straminipila - "water molds"
  - Kingdom Mycetozoa - "slime molds"

Fungi in a Broad Sense (cont.)



Domains of living organisms.
Source: Kendrick, 2003

Fungi in a Broad Sense (cont.)

- Kingdom Fungi (Mycota)
  - Phylum: Chytridiomycota
  - Phylum: Zygomycota
  - Phylum: Glomeromycota
  - Phylum: Ascomycota
  - Phylum: Basidiomycota
  - Form-Phylum: Deuteromycota (Fungi Imperfecti)

Fungi in a Broad Sense (cont.)

- Kingdom Straminipila (Chromista)
  - Phylum: Oomycota
  - Phylum: Hyphochytridiomycota
  - Phylum: Labyrinthulomycota

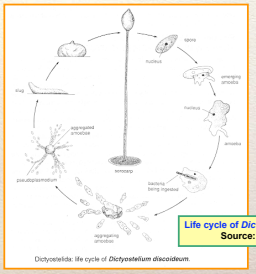
Fungi in a Broad Sense (cont.)

- Kingdom Mycetozoa
  - Phylum: Myxomycota
  - Phylum: Dictyosteliomycota
  - Phylum: Acrasiomycota
  - Phylum: Plasmodiophoromycota

The Mycetozoa (Slime Molds)

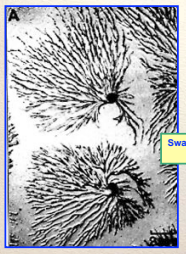
- Kingdom Mycetozoa is comprised of four phyla containing three different groups of organisms that differ in their trophic (feeding) stages
  - Myxogastrids - plasmodial
  - Dictyostelids and acrasids - amoeboid
  - Protostelids - obligate parasites having two plasmodial stages

The Mycetozoa (cont.)



Life cycle of *Dictyostelium discoideum*.
Source: Kendrick, 2003

The Mycetozoa (cont.)



Swarming amoebae of *D. discoideum*.
Source: Kendrick, 2003

The Mycetozoa (cont.)

Scanning electron micrographs of various life cycle stages of *D. discoideum*.
Source: www.spectrosciences.com/article.php3?id_article=19

The Chromistans

- The term 'Chromistan Fungi' is oxymoronic in that:
  - Chromists are a broadly diverse of protists containing stramenopiles (also spelled straminiples), but not true fungi
  - Phylogenetic evidence suggests a monophyletic origin quite distinct from the true fungi, most likely a red algal ancestor

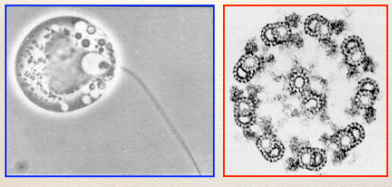
The Chromistans (cont.)

- Chromists contain not only the stramenopiles, but also haptophytes and cryptophytes
- Chromists seem to share a common ancestry with alveolates (ciliates, sporozoans, dinoflagellates)

The Stramenopiles

- Stramenopiles are also known as heterokonts, referring to two types of flagella found in this group
  - Smooth (whiplash) flagellum
  - "Tinsillated" (or tinsel) flagellum
    - Contains stiff lateral hairs (mastigonemes)
    - Pulls, doesn't push, cell through the medium

The Stramenopiles



Zoospore with flagellum and typical 9+2 cross section of a single flagellum.
Source: Kendrick, 2003

The Stramenopiles

Tinsel vs. whiplash flagella.
Source: Kendrick, 2003

The Stramenopiles (cont.)

- Number/kind of flagella varies among the different groups of organisms
- Stramenopiles include diatoms and kelps in addition to fungus-like microbes
- Kingdom Straminipila
  - Comprised of three fungal-like phyla
    - Hyphochytridiomycota
    - Oomycota
    - Labyrinthulomycota

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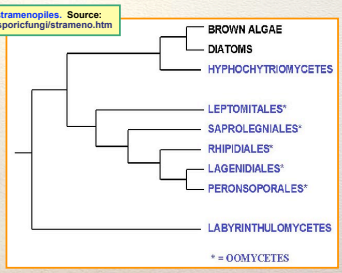
The Stramenopiles (cont.)

Phylogenetic tree of the stramenopiles. Source: www.plantbio.uga.edu/zoosporicfungi/strameno.htm



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