

**Reference Guide to the Classification of Fungi and Fungal-like Protists,  
with Emphasis on the Genera with Medical Importance (circa 2006)**

This outline lists some common genera of fungi and fungal-like protists, which are classified into a number of phyla, classes, and in most cases orders and families. The classification is patterned after the broad schemes of Margulis and Schwartz (1) Hawksworth et al. (2), Eriksson et al. (5), Alexopoulos et al. (7), and Lutzoni et al. (8) and was devised by PJS to reflect his perception of the relationships of the various organisms traditionally studied by mycologists and included in textbooks and manuals dealing with mycology. The classification ranks below class reflect interpretations of Koch (3), Hanlin and Ulloa (4), Alexopoulos et al. (7), and Hawksworth et al. (2). It should be noted that different biologists have varying opinions on which organisms to include in the Kingdom Fungi and on what rank should be accorded each major group. This classification outline distributes the fungi and fungal-like organisms dealt with in mycology among the three kingdoms, Protozoa, Chromista and Fungi. With only a relatively few exceptions, the genera listed are very common or are of medical importance. However, not all genera of fungi involved in human and animal medical mycology are listed.

**Kingdom: Protozoa/Amoebozoa** (collection of numerous phyla of eukaryotic, wall-less, unicellular, plasmodial, or colonial phagotropic microorganisms, which includes at least four fungal-like phyla that are no longer considered to be part of the Kingdom Fungi). These have all been reclassified and renamed to reflect their nonfungal nature (see for example Reserve Reading Sz 5, which discusses the reclassification of *Rhinosporidium seeberi*).

**Phylum: Acrasiomycota** (acacid cellular slime molds)

**Phylum: Dictyosteliomycota** (cellular slime molds)

**Phylum: Myxomycota** (plasmodial slime molds)

**Phylum: Plasmodiophoromycota** (parasitic plasmodial water molds)

**Kingdom: Chromista/Stramenopiles** (collection of eukaryotic walled microorganisms that produce heterokont wallless cells in their life cycles, and which includes two fungal-like groups that are not currently considered to be monophyletic ancestors of any members of the Kingdom Fungi)

**Phylum: Hyphochytridiomycota** (hyphochytrids)

**Phylum: Oomycota** (egg-bearing aquatic phycomycetes) or Peronomycota

**Class: Oomycetes**

Order: Peronosporales (damping-off fungi, white rusts, downy mildews)

Family: Pythiaceae

*Pythium insidiosum* (agent of swamp cancer of horses and pythiosis in man)

**Kingdom: Fungi** (collection of eukaryotic walled microorganisms, which includes four or five Phyla that are mostly amastigote [lack undulopodia (flagella) except for the Chytridiomycota] and usually form spores during their life cycle)

**Subkingdom: Mastigomycotera** (flagellate sporangial fungi, flagellate lower fungi, flagellate phycomycetes; aquatic phycomycetes)

**Phylum: Chytridiomycota** (chytrids, posteriorly uniflagellate fungi)

**Class: Chytridiomycetes** (3-5 orders)

Order: Chytridiales (also Blastocladales, Monoblepharidales, Spizellomycetales, Neocallimasticales)

Family: unnamed

*Batrachochytridium* (newly described genus for agents of chytridiomycosis of amphibians)

**Subkingdom: Amastigomycotera** (nonflagellate sporangial fungi, nonflagellate lower fungi, nonflagellate phycomycetes; nonaquatic phycomycetes)

**Phylum: Zygomycota** (nonaquatic phycomycetes, spore-forming sporangial fungi)

**Class: Zygomycetes**

Order: Mucorales (mucors, black bread molds; many agents of zygomycosis)

Family: Mucoraceae

*Absidia*

*Mucor*

*Rhizopus*

Family: Pilobolaceae

*Pilobolus*  
 Family: Coanephoraceae  
*Cokeromyces*  
 Family: Cunninghamellaceae  
*Cunninghamella*  
 Family: Mortierellaceae  
*Mortierella*  
 Family: Saksenaeeae  
*Saksenaea*  
 Order: Entomophthorales (many pathogens of insects)  
 Family: Entomophthoraceae  
*Conidiobolus*  
 Family: Basidiobolaceae  
*Basidiobolus*  
**Class: Trichomycetes**  
**Phylum: Glomeromycota** (the endomycorrhizal fungi)<sup>8</sup>  
**Class: Glomeromycetes**  
 Order: Glomerales  
*Gomus*  
**Subkingdom: Eumycotera** (higher fungi, septomycetes) or **Dikaryomycotera**  
**Phylum: Ascomycota** (sac fungi)  
**Subphylum: Hemiascomycotina** (nonascocarpic ascomycetes I) or **Saccharomycotina**<sup>5, 8</sup> (newest)  
**Class: Hemiascomycetes** (contains known or suspected candidiasis agents) or **Saccharomycetes**<sup>5</sup>  
 Order: Saccharomycetales (ascomycetous yeasts, mostly)  
 Family: Saccharomycetaceae  
*Debaromyces*, teleomorphic genus of some *Candida sp.*  
*Kluyveromyces*, teleomorphic genus of some *Candida sp.*  
*Lodderomyces*, teleomorphic genus of some *Candida sp.*  
*Pichia*, teleomorphic genus of some *Candida sp.*  
*Saccharomyces* (budding yeasts)  
**Subphylum: Archiascomycotina** (nonascocarpic ascomycetes II) or **Taphrinomycotina**<sup>5, 8</sup>  
**Class: Archiascomycetes** or **Schizosaccharomycetes**<sup>6</sup>  
 Order: Schizosaccharomycetales  
 Family: Schizosaccharomycetaceae  
*Schizosaccharomyces* (fission yeasts)  
**Class: Pneumocystidiomycetes**<sup>5</sup>  
 Order: Pneumocystidiales  
 Family: Pneumocystideaceae  
*Pneumocystis jirovecii* (agent of human *Pneumocystis* pneumonia (PCP))  
**Class: Taphrinomycetes**<sup>5</sup>  
 Order: Taphrinales  
*Taphrina*  
**Subphylum: Euascomycotina** (ascocarpic ascomycetes) or **Pezizomycotina**<sup>5, 8</sup>  
**Class: Plectomycetes** (cleistothecial ascomycetes) or **Eurotiomycetes**<sup>5</sup>  
 Order: Eurotiales  
 Family: Eurotiaceae  
*Eurotium*, *Emericella*, teleomorphic genera of some *Aspergillus*  
*Talaromyces*, teleomorphic genus of some *Penicillium*  
 Order: Onygenales  
 Family: Gymnoascaceae  
*Ajellomyces*, teleomorphic genus of *Blastomyces dermatitidis* and *Histoplasma capsulatum*  
*Arthroderma*, teleomorphic genus of sexual *Microsporum*, *Trichophyton* and probably  
*Epidermophyton* anamorphs  
*Uncinocarpus*, possible teleomorphic kin of *Coccidioides immitis*  
**Class: Pyrenomycetes** (perithecial ascomycetes) or **Sordariomycetes**<sup>5</sup>  
 Order: Microascales

Family: Microascaceae  
*Pseudalleschia*, teleomorphic genus of *Scedosporium apiospermum*  
 Order: Ophiostomatales  
 Family: Ophiostomataceae  
*Ophiostoma*, possible teleomorphic genus of *Sporothrix schenckii*  
 Order: Clavicipitales  
 Family: Clavicipitaceae  
*Claviceps*, ergot alkaloids (St. Anthony's Fire)  
**Class: Discomycetes** (apothecial ascomycetes) or **Pezizomycetes**<sup>5</sup>  
 Order: Pezizales (epigean, operculate discomycetes)  
 Family: Helvellaceae  
*Gyromitra* (false morels) cause ascomycete mushroom poisoning  
**Class: Loculoascomycetes I or Dothidiomycetes**<sup>5,8</sup>  
 Order: Dothideales, possible teleomorphic order for *Hortaea werneckii*  
 Family: Piedraiaceae  
*Piedraia hortae* (agent of black piedra)  
**Class: Loculoascomycetes II or Chaetothyriomycetes**<sup>5,8</sup>  
 Order: Chaetothyriales, possible teleomorphic orders of some Dematiaceae  
 Family: Herpotrichileaceae, possible teleomorph family of such Dematiaceae form-genera as  
*Cladophialophora*, *Exophiala*, *Fonsecea*, *Phialophora*, *Rhamichloridium*, *Wangiella*  
**Class: Lichinomycetes** (class that contains the fungal partners of lichens)<sup>8</sup>  
**Phylum: Basidiomycota** (club fungi)  
**Subphylum: Heterobasidiomycotina** ("lower" basidiomycetes)  
**Class: Urediniomycetes** (rusts)  
**Class: Ustilaginomycetes** (smuts)  
 Order: Ustilaginales  
 Order: Malasseziales, possible teleomorphic order for *Mallassezia furfur*  
**Subphylum: Holobasidiomycotina** ("higher" basidiomycetes) or **Basidiomycotina**  
**Class: Phragmobasidiomycetes** (jelly fungi; septate basidial fungi)  
 Order: Tremellales (some have "cruciate-septate" basidia), possible teleomorphic order for  
*Trichosporon asahii*  
 Family: Filobasidiaceae  
*Filobasidiella*, the teleomorphic genus of *Cryptococcus neoformans*  
 Order: Auriculariales (have "transversely septate" basidia)  
**Class: Holobasidiomycetes** (many orders of mushrooms, toadstools, etc.) or **Hymenomycetes**<sup>6</sup>  
 Order: Dacrymycetales (have "tuning fork-type" basidia)  
 Order: Tulasnellales (have holobasidia with swollen sterigmata)  
 Family: Schizophyllaceae (split gill fungi)  
*Schizophyllum* - rare infections  
 Order: Agaricales (gill fungi)  
 Family: Amanitaceae  
*Amanita* (death angel genus) - most important mushroom poisoning genus  
 Family: Coprinaceae  
*Coprinus* - mushroom poisonings  
 Family: Lepiotaceae  
*Lepiota* - mushroom poisonings  
 Order: Lycoperdales (puffballs)  
*Lycoperdon* (snuff)  
 Order: Porales (woody pore fungi)  
**Phylum: Fungi Imperfecti** (imperfect fungi, asexual fungi, anamorphic fungi, mitosporic fungi) or  
**Deuteromycota**,  
**Form-class: Blastomycetes** (imperfect yeasts, most common yeast form-genera that cause infections)  
 Form-order: Cryptococcales  
 Form-family: Cryptococcaceae  
*Candida*  
*Cryptococcus*

*Malassezia*  
*Pityrosporum*  
*Rhodotorula*  
*Trichosporon*

**Form-class: Hyphomycetes** (asexual hyphal form-genera that do not form multihyphal aggregates in association with their conidiophores and conidia; cause infections, allergies and mycotoxicosis)

Form-order: Moniliales (conidial and synnematosus imperfects)

Form-family: Moniliaceae (abbreviated list of form-genera that produce mostly colorless hyphae, at least when young)

*Aspergillus*  
*Blastomyces*  
*Coccidioides*  
*Epidermophyton*  
*Geotrichum*  
*Histoplasma*  
*Microsporum*  
*Paracoccidioides*  
*Penicillium*  
*Sporothrix*  
*Trichophyton*  
etc.

Form-family: Dematiaceae (abbreviated list of asexual form-genera that produce dark brown or black vegetative growth throughout their life cycle)

*Alternaria*  
*Bipolaris*  
*Cladophialophora*  
*Curvularia*  
*Exophialia*  
*Fonsecea*  
*Helminthosporium*  
*Phialophora*  
*Wangiella*  
etc.

Form-family: Tuberculariaceae

**Form-class: Coleomycetes** (asexual form-genera that produce multihyphal structures in association with their conidia and conidiophores)

*Phoma*

**Form-class: Mycelia sterilia** (asexual form-genera that produce hyphae but no conidia)

## References

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