

Kingdom Fungi

Introduction to important terms

Hypha: A hypha (plural *hyphae*) is a long, filamentous cell of a fungus, constituting the main mode of vegetative growth. A hypha consists of one or more cells surrounded by a tubular cell wall. In most fungi, hyphae are divided into compartments by internal cross-walls

Septa: These are dividing cross walls along the length of a hypha. They usually leave an opening at the centre called a septal pore. It is for this reason hyphae are said to have compartments and not cells because no single compartment has protoplasm exclusively to itself. The singular form of septa is *septum*.

Mycelium: A collection of hyphae of one fungus growing in one place is known as *mycelium*.

Gametangia: The organ of a fungus where gametes are produced. The singular of gametangia is *gametangium*. A gametangium is a haploid structure and formation of gametes does not involve meiosis

Monoecious fungi: Fungal species which produce male and female sex organs in the same thallus (thus, *hermaphrodite*).

Thallus: This is body of an organism that is not differentiated into roots, stem and leaves.

Dioecious: Fungi that produce male and female sex organs on separate thalli.

Heterokaryosis: Heterokaryosis (from the Greek *heteros*, meaning *other* and *karyon*, meaning *kernel*) means to have two or more genetically different nuclei within the same mycelium of a fungus. The nuclei within the same mycelium may differ from one another either through the accumulation of mutations or through the fusion of genetically distinct hyphae. This can lead to individuals that have different nuclei in different parts of their mycelium.

Dikaryotic hypha: A hypha that contains paired haploid nuclei.

Spore: A spore is a reproductive cell that develops into a new organism without the need to fuse with another reproductive cell. Spores that are not contained in a capsule are referred to as **conidia**.

Sporangium: This is a capsule that produces spores called sporangiospores.

Asci: This is a capsule that produces a special type of spore called ascospores

Basidia: This is a capsule that produces a kind of spore called basidiospores

Phylum

Chytridiomycota: The Chytridiomycetes are represented by a group of primitive aquatic fungi, which comprise approximately 800 species. They produce motile gametes assisted by flagella. Their cell wall composition is mostly chitin. This group was placed in the Eumycota after molecular work with rDNA. The phylum Chytridiomycota has one class the Chytridiomycetes with the orders; Chytridiales and Blastocladales.

Phylum Zygomycota: The Zygomycetes are characterised by the formation of sexual spores called zygospores. They are a result of fertilization between two haploid nuclei to form a diploid zygote. The zygote immediately undergoes meiosis forming haploid cells called zygospores. The outer coats of these cells are variously sculptured and are held between the tips of the mother hyphae. Two classes are recognised in this phylum and these are; Trichomycetes and Zygomycetes. The species of a Zygomycete can be determined from the type of zygospore produced. An example of a Zygomycete is the bread mold, *Rhizopus nigricans*.

Phylum Ascomycota: The Ascomycetes are also called the 'sac fungi' because their sexual spores, the ascospores, are enclosed in a tube-like sac called an ascus. The formation of ascospores is similar to that of zygospores, except that the ascospores formed by meiosis are enclosed in the ascus. *Neurospora crassa* is an ascomycete mold that is used extensively in studies of genetics. The class Ascomycetes includes the unicellular orders Saccharomycetales and Schizosaccharomycetales, the yeasts. The filamentous Ascomycetes include the orders Eurotiales whose fruiting bodies are cleistothecia, the Sordariales and Xylariales whose fruiting bodies are perithecia, Pezizales whose fruiting bodies are apothecia and the Dothideales whose fruiting bodies are ascostroma.

Phylum Basidiomycota: The Basidiomycetes are called the 'club fungi'. Their sexual spores, the basidiospores, are formed on fruiting structures called basidia. The Basidiomycetes include some of the fungi whose aggregation of the hyphae result in the development of fruiting structures that are visible to the naked eye. Such fungi are called mushrooms and fall under the order Agaricales. The group includes the classes Teliomycetes, which comprise the rusts and the Uromycetes, which embrace the smuts.

Phylum Deuteromycota: This group of fungi is also called the 'imperfect fungi'. This is a group of fungi whose sexual stage has not yet been discovered. As the sexual stage of a fungus is discovered the fungus is removed from this group and gets its position in the Ascomycota. The orders of this group are; Moniliales whose conidia arise on conidiophores that are produced on mycelium (*Alternariatenuis*), Sphaeropsidales whose conidia are borne on conidiophores are produced in pycnidia(*Phomopsis*ssp.), Melanconiales whose conidia borne on conidiophores are produced in acervuli (*Pestalotiasp.*), Sterlia which produce sterile mycelium and therefore no conidia are produced, but other mycelial structures must be used for their propagation such as sclerotia (*Sclerotium*sp.)

Lichens and Mycorrhizae: These are examples of beneficial associations between two different organisms. In Lichens there is an association between an alga (autotroph) with a fungus (heterotroph). The alga provides the fungus with a carbon source while the fungus provides the alga with nutrients from the substratum. The same applies to the association of fungi with plant roots when they form mycorrhizae. The fungus provides the root system of a plant with mineral nutrients while the fungus gets the carbon source from the plant in return. These are mutualistic associations.

Structure

Two structural forms exist among the fungi. One kind is unicellular as represented by the yeast cells. The other form is made up of thread like structures. Individual threads are known as **hyphae** whose singular form is **hypha**. Collectively hyphae are known as mycelium whose plural form is **mycelia**. The mycelium is the vegetative phase of a fungus, which subsequently gives rise to the reproductive structures. Whether it is a yeast cell or a filamentous fungus consisting of hyphae, fungi are typically made up of a porous outer cell wall made up of chitin, unlike the cell wall of plants that is made up of cellulose. Inner to the cell wall is a cell membrane that is convoluted in places to increase its surface area for exchange of materials. These structures are called lomasomes. The cell membrane encloses the cytoplasm, which suspends the cellular organelles typical of a eukaryotic cell.

Significance of Members of Kingdom Fungi.

Fungi are important in the food industry. Mushrooms which are the macroscopic fruiting structures of the Basidiomycota form a delicacy at the dining table in many countries. A variety of species including *Penicillium* sp. are used to add flavour to cheese. The cheese flavour would depend on the fungus species the cheese is inoculated with. The yeasts are important in the leavening of dough in baking and the fermentation processes of wine and beer manufacturing. In ecological systems, fungi are useful in the breakdown of organic matter and organic wastes and therefore contribute significantly to the recycling of nutrients and cleaning up of wastes in an ecosystem. They are also an important tool in research, because several generations of a fungus can be produced in a short time. The field of medicine has benefited immensely from the exploitation of fungi for their medicinal value. As mycorrhizal fungi they are known to have a mutualistic existence with plants, in which plants enhance their phosphorus uptake, while the fungus benefits from the carbon source provided by the host plant. On the other hand fungi are an agricultural inconvenience because they cause disease on plants and animals, which cost farmers billions worth of profits. A large number of fungi cause a variety of diseases in plants, but only a few species cause disease in animals and humans, and when they do they cause persistent illnesses.