

Characteristics of Fungi

The fungi (sing., fungus) are a diverse group of eukaryotic microorganisms that are heterotrophic and typically saprozoic. In addition to the well-known macroscopic fungi (such as mushrooms and molds), many unicellular yeasts and spores of macroscopic fungi are microscopic. For this reason, fungi are included within the field of microbiology.

Some 75,000 species have been described, although as many as 1.5 million may exist. For many decades, fungi were classified as plants, but laboratory studies have revealed at least four properties that distinguish fungi from plants:

- Fungi lack chlorophyll, while plants have this pigment.
- Fungal cell walls contain a carbohydrate called chitin; plant cell walls have cellulose.
- Most fungi are not truly multicellular like plants.
- Fungi are heterotrophic, while plants are autotrophic. Mainly for these reasons, fungi are placed in their own kingdom Fungi, within the domain Eukarya of the “tree of life” (see Chapter 3).

The study of fungi is called mycology (myco = “fungus”) and a person who studies fungi is a mycologist.

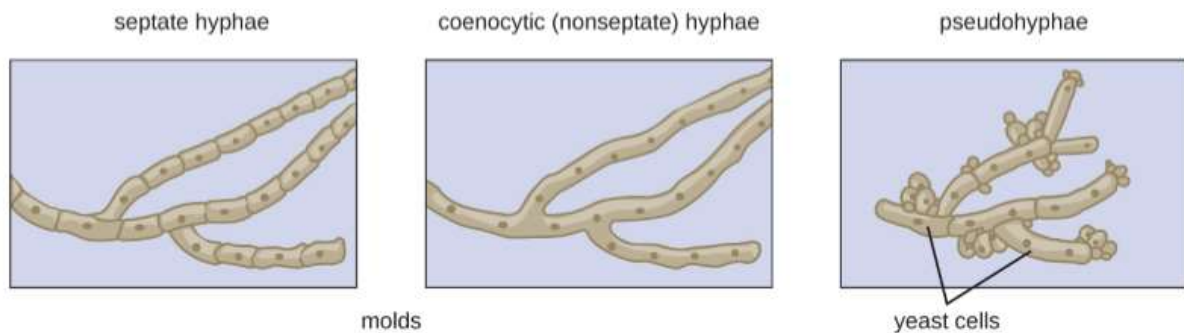
Fungi are important to humans in a variety of ways. Both microscopic and macroscopic fungi have medical relevance, with some pathogenic species that can cause mycoses (illnesses caused by fungi). Some pathogenic fungi are opportunistic, meaning that they mainly cause infections when the host’s immune defenses are compromised and do not normally cause illness in healthy individuals.

Fungi are important in other ways. They act as decomposers in the environment, and they are critical for the production of certain foods such as cheeses. Fungi are also major sources of antibiotics, such as penicillin from the fungus *Penicillium*.

Fungi generally have life cycles involving two phases: a growth (vegetative) phase and a reproductive phase. A major group of fungi, the molds, which you have come to appreciate already from the chapter opener, grow as long, tangled filaments of cells that give rise to visible colonies . Another group, the yeasts, are unicellular organisms whose colonies on agar visually resemble bacterial colonies . Yet other forms are dimorphic; usually at ambient temperature (25°C) they grow as filamentous molds, but at body temperature (37°C) they convert to unicellular, pathogenic, yeast-like forms.

The molds consist of masses of intertwined filaments called **hyphae** (sing., hypha). The hyphae are the morphological unit of a filamentous fungus and individual hyphae usually are visible only with the aid of a microscope . Hyphae have a broad diversity of forms and can be highly branched. A thick mass of hyphae is called a **mycelium** (pl., mycelia). This mass is usually large enough to be seen with the unaided eye, and generally it has a rough, cottony texture . The mycelium along with any reproductive structures would represent the fungal organism. Being eukaryotic organisms, fungi have one or more nuclei as well as a range of organelles including mitochondria, an endomembrane system, ribosomes, and a cytoskeleton.

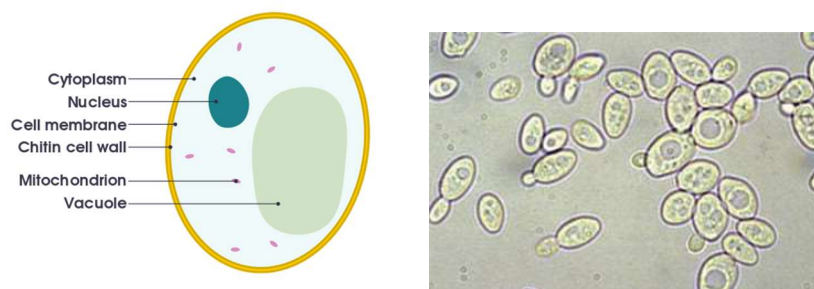
The cell wall is composed of large amounts of chitin. Chitin is a carbohydrate polymer of acetylglucosamine units; that is, glucose molecules containing amino and acetyl groups. The cell wall provides rigidity and strength, which, like the cell wall of all microorganisms, allows the cells to resist bursting due to high internal water pressure.



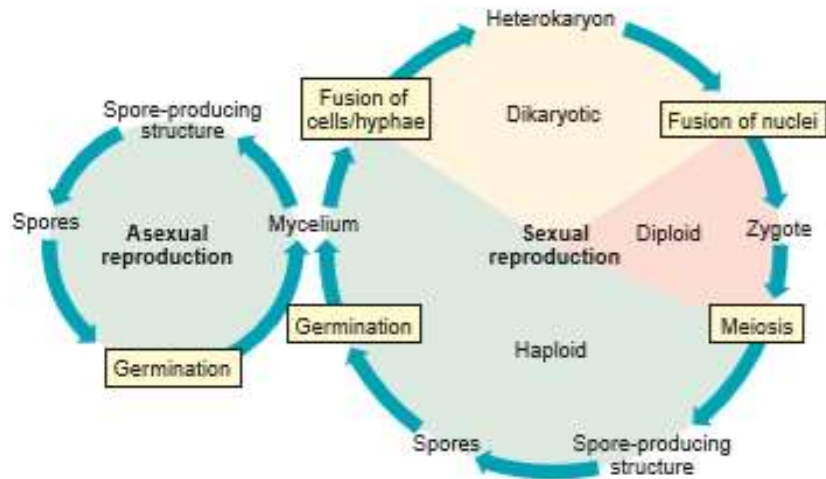
Multicellular fungi (molds) form hyphae, which may be septate or nonseptate. Unicellular fungi (yeasts) cells form pseudohyphae from individual yeast cells

(<https://openstax.org/details/books/microbiology>)

In contrast to molds, yeasts are unicellular fungi. The budding yeasts reproduce asexually by budding off a smaller daughter cell; the resulting cells may sometimes stick together as a short chain or pseudohypha. *Candida albicans* is a common yeast that forms pseudohyphae; it is associated with various infections in humans, including vaginal yeast infections, oral thrush, and candidiasis of the skin. Some fungi are dimorphic, having more than one appearance during their life cycle. These dimorphic fungi may be able to appear as yeasts or molds, which can be important for infectivity. They are capable of changing their appearance in response to environmental changes such as nutrient availability or fluctuations in temperature, growing as a mold, for example, at 25 °C (77 °F), and as yeast cells at 37 °C (98.6 °F). This ability helps dimorphic fungi to survive in diverse environments. *Histoplasma capsulatum*, the pathogen that causes histoplasmosis, a lung infection, is an example of a dimorphic fungus



1- [https://commons.wikimedia.org/wiki/File:Simple_diagram_of_yeast_cell_\(en\).svg](https://commons.wikimedia.org/wiki/File:Simple_diagram_of_yeast_cell_(en).svg)



Many fungi have both an asexual and sexual reproduction characterized by spore formation. The unique phase in the life cycle is the presence of a heterokaryon where nuclei from two different mating types remain separate (dikaryotic) in a common cytoplasm (**Alcamo's 2011**)

References:

- 2- Alcamo's Fundamentals of Microbiology, 2011, Ninth Edition (9 ed.) by Jeffrey C. Pommerville, Jones & Bartlett Publishers, Canada
- 3- "Download for free at <https://openstax.org/details/books/microbiology>."
- 4- [https://commons.wikimedia.org/wiki/File:Simple_diagram_of_yeast_cell_\(en\).svg](https://commons.wikimedia.org/wiki/File:Simple_diagram_of_yeast_cell_(en).svg)