

Mycology II

Lecture 21

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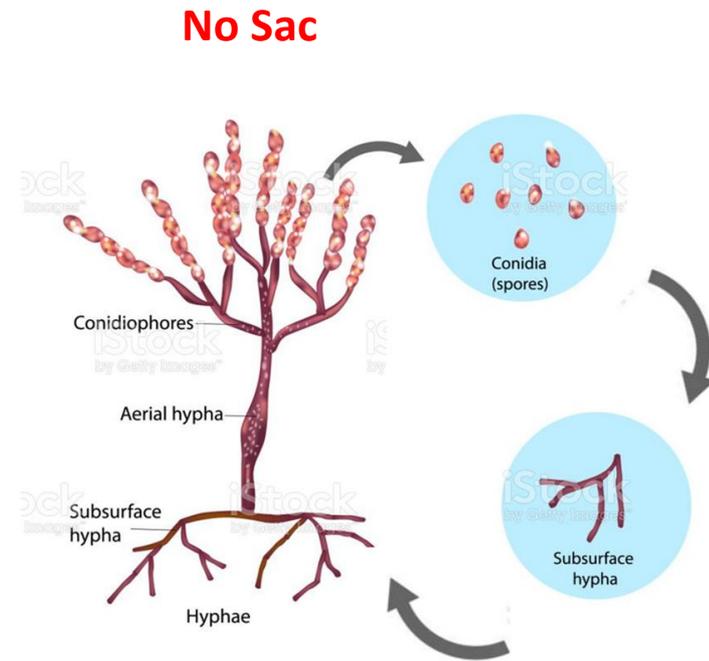
Faculty of Dentistry

2025-2026

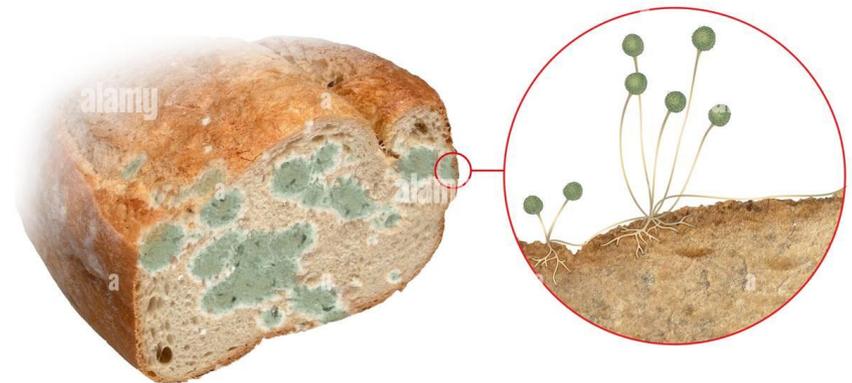


Molds

- Molds reproduction by **conidia** (spores) (Asexual)
- **Conidia** (It is an asexual spore produced on a conidiophore for certain fungi).
- Molds composed of long, tangled, branching filaments that form visible colonies.
- Each individual filament is called a **hypha** (plural: hyphae).
- As hyphae grow and branch, they form a mass known as a **mycelium** (plural: mycelia).
- Most hyphae in the mycelium remain embedded in soil or the nutrient medium and are not visible.
- Some hyphae grow **upward** as aerial hyphae, which bear reproductive structures such as mushrooms and produce spores.

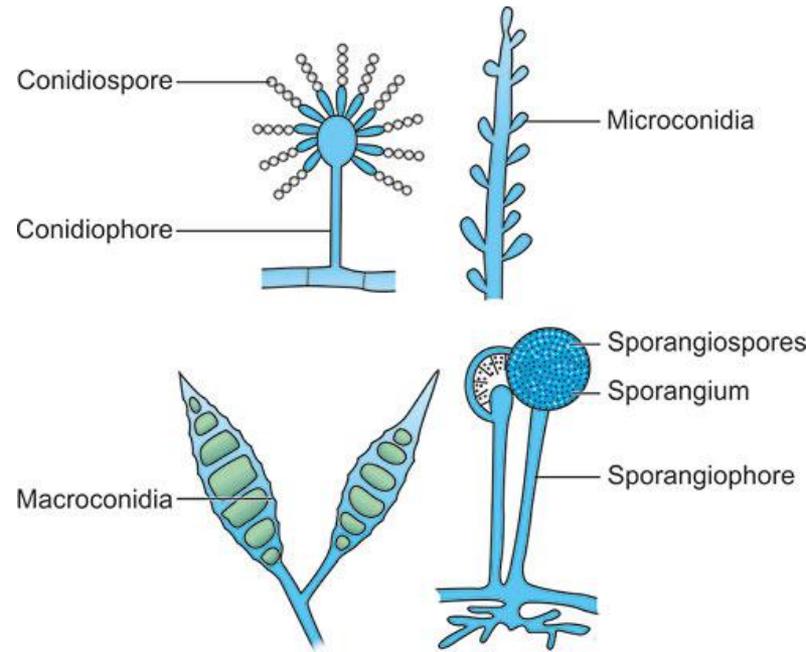


Reproduction



Reproduction

- **Conidia:** Are asexual, non-motile fungal spores (mitospores) produced via mitosis for dispersal, varying in size (**macro/micro**) and shape.
- **Macroconidia:** Larger, often multi-celled spores multi septate conidia, spindle or sickle-shaped.
- **Microconidia:** Smaller, simpler, usually single-celled (e.g., oval/spherical)

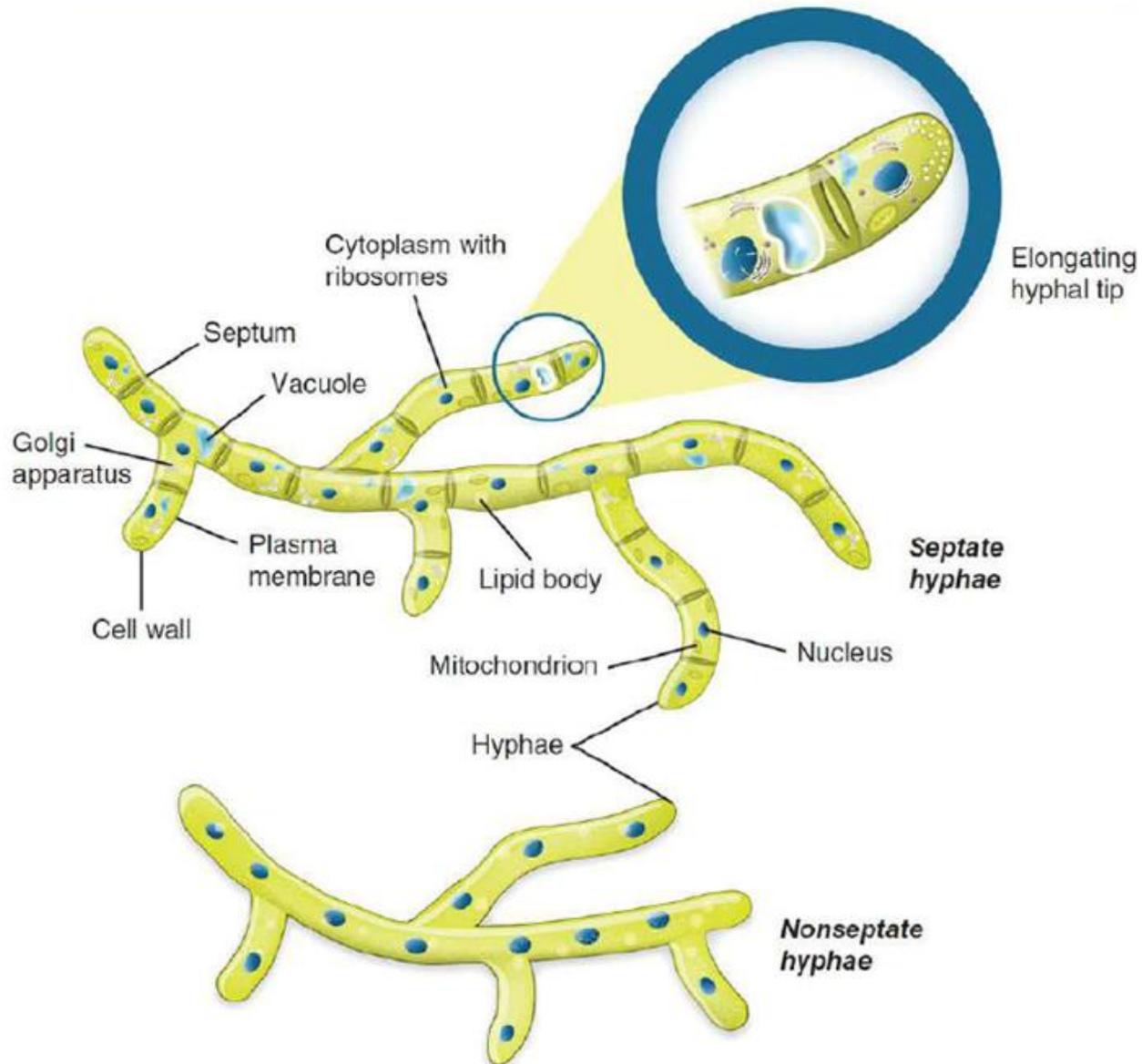


Reproduction

- Many fungal hyphae contain septa (cross walls) that divide the hypha into connected, cell-like compartments.
- Each septum has a pore, allowing cytoplasm to flow and mix between adjacent compartments.
- Some molds lack septa entirely; these are nonseptate hyphae.
- **Nonseptate** hyphae are **Coenocytic**, meaning they contain many nuclei within one continuous cytoplasm.
- This filamentous, multinucleated structure is unique to fungi and not found in other organisms.

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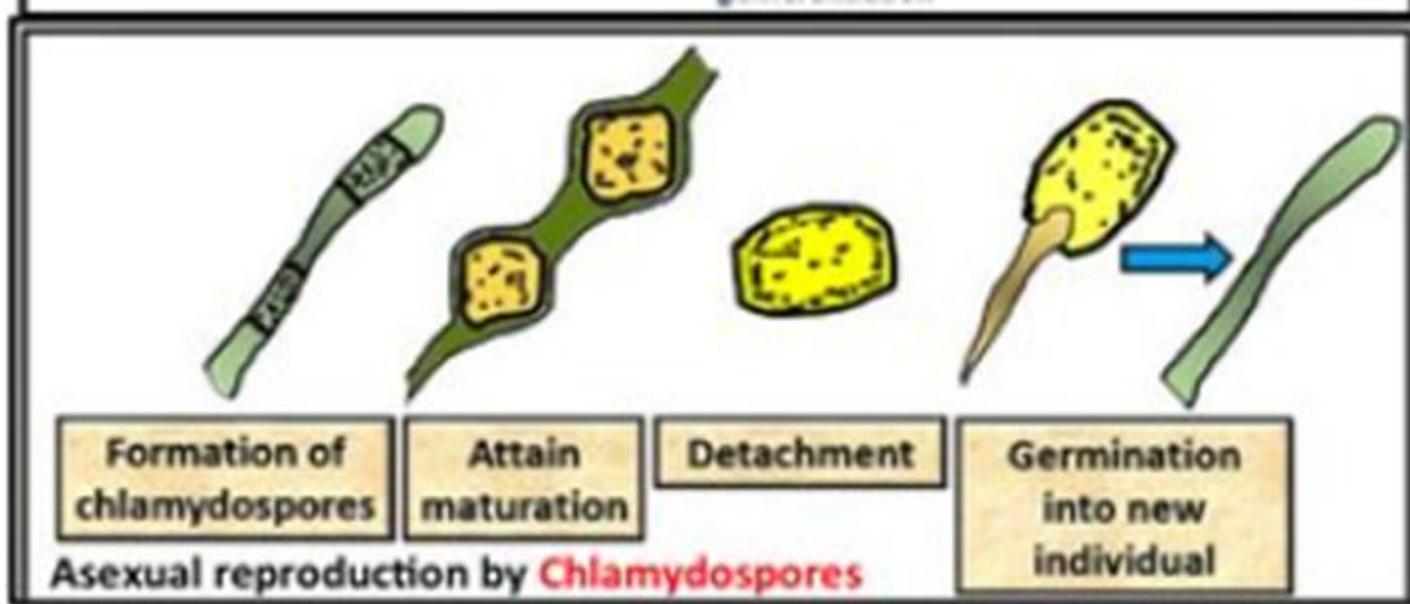
Molds have hyphae that are either septate or nonseptate. Septa compartmentalize hyphae into separate cells, although the septa have a pore through which cytoplasm and nuclei can move.



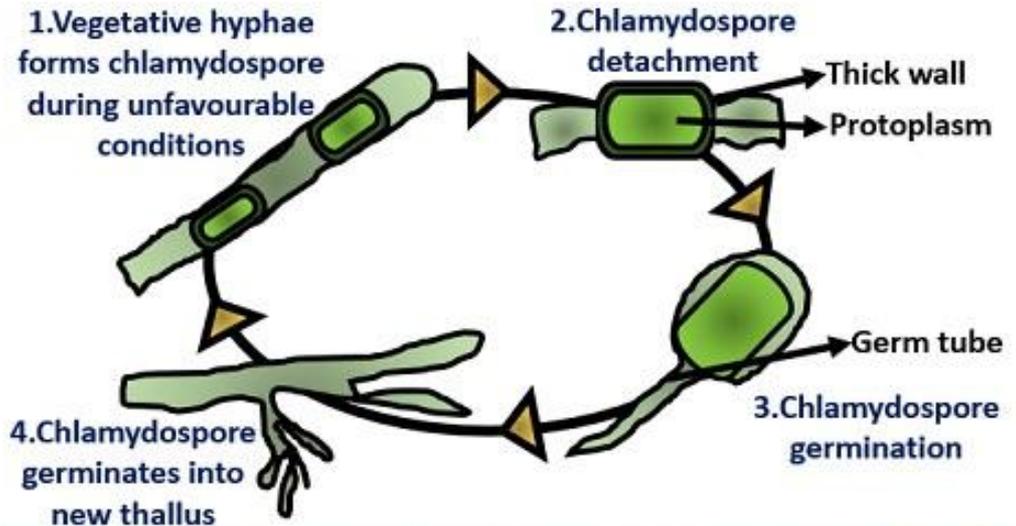
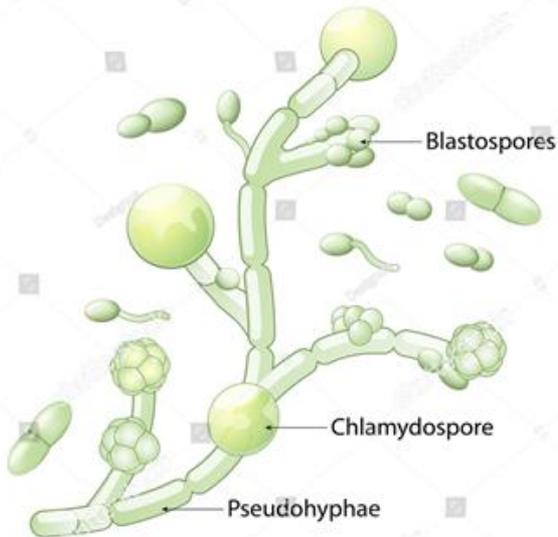
Reproduction

❖ Chlamyospore

- The name comes from the Greek chlamys (**coat**), referring to their thick protective coating
- Is a thick-walled, asexual resting spore produced by fungi (like *Candida albicans*, *Histoplasma capsulatum*) and some **algae** for survival in harsh conditions.
- These enlarged vegetative cells develop a dense cytoplasm and a protective coat to withstand heat, dryness, or nutrient deprivation.



Candida albicans

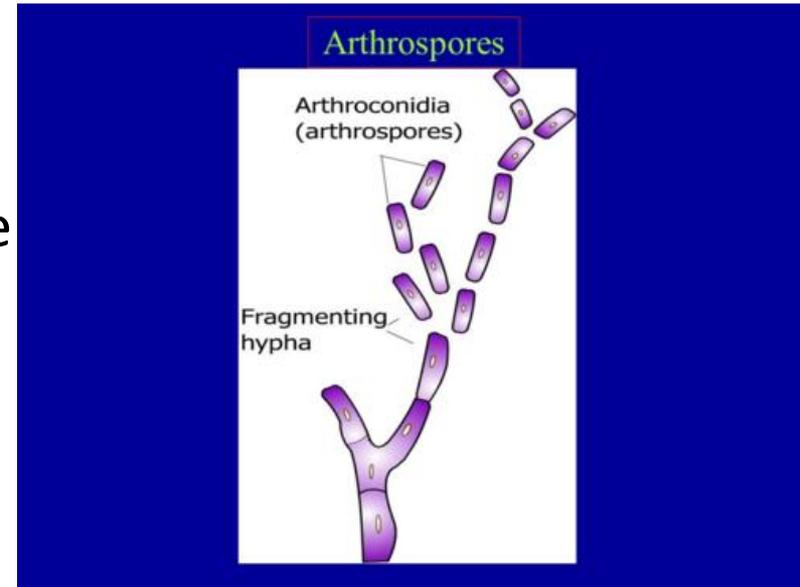


Asexual reproduction of *Rhizopus* by chlamydozoospores

Reproduction

❖ Arthrospores

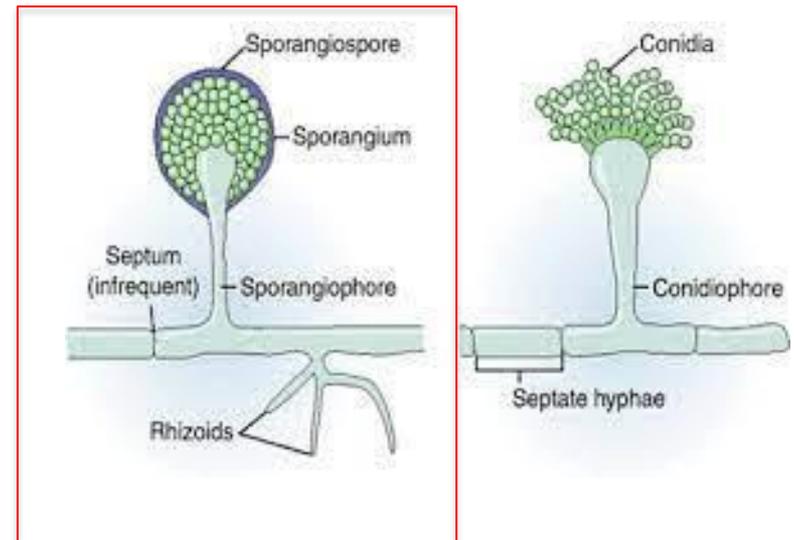
- Arthrospores also called (arthroconidia)
- Formed by the fragmentation of hyphae into individuals.
- Often thick-walled, spore-like cells that serve for reproduction or survival.
- These spores are highly resilient.
- Hyphae are separated by septumes
- **Mycoses** in humans
- Examples:
 - *Coccidioides immitis*: **Valley Fever**
 - **Dermatophytosis**: That cause common skin, hair, and nail infections.



Reproduction

❖ Sporangiospore

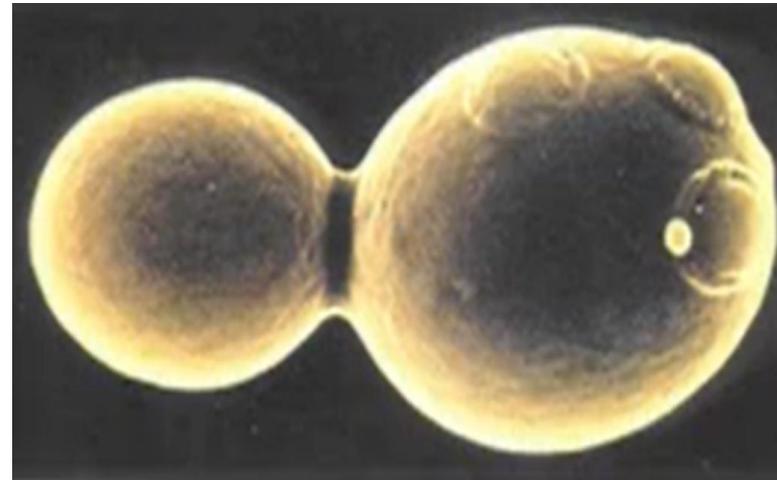
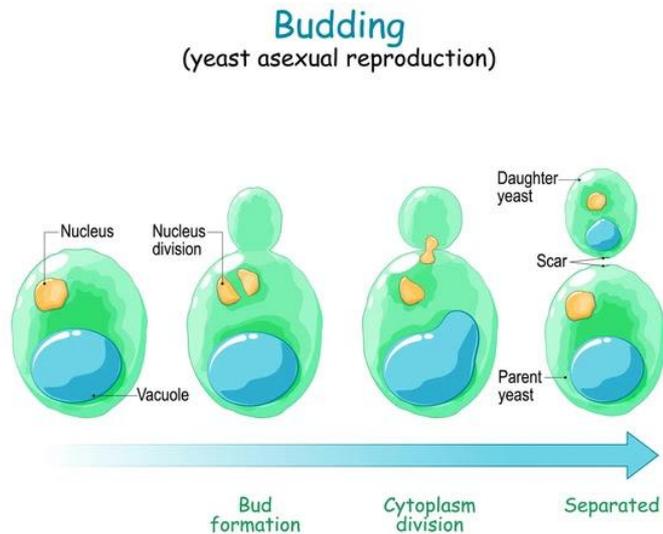
- A **sporangiospore** is an asexual fungal spore formed inside a sac-like structure called a **sporangium**.
- **hyphae called sporangiophore**
- Found in fungi like *Rhizopus* (Zygomycetes)



Reproduction

❖ Blastospore

- Are asexual fungal spores produced by budding, forming from a parent cell or hyphae, often found in yeasts.
- A small bud forms & finally separate.



Difference Between Yeast and Mold

Feature	Yeast	Mold
Cell Type	Unicellular fungi	Multicellular fungi
Morphology	Round or oval cells	Filamentous, branching hyphae forming mycelium
Growth Form	Single cells; smooth, creamy colonies on agar, Pseudohyphae	Cottony, fuzzy, wooly colonies, elongation and branching
Replicate	By budding	By spores
Growth Rate	Fast (hours to days)	Slower (days to weeks)
Oxygen Requirement	Facultative anaerobes (can grow without oxygen)	Strictly aerobic
Temperature Tolerance	Many grow at 37°C	Most prefer lower temperatures (25–30°C)
Examples	Candida, Cryptococcus, Saccharomyces	Aspergillus, Penicillium, Rhizopus, Mucor
Clinical Role	Often cause mucocutaneous infections, opportunistic systemic infections	Cause allergies, toxicosis, invasive infections in immunocompromised

Classification of Fungi

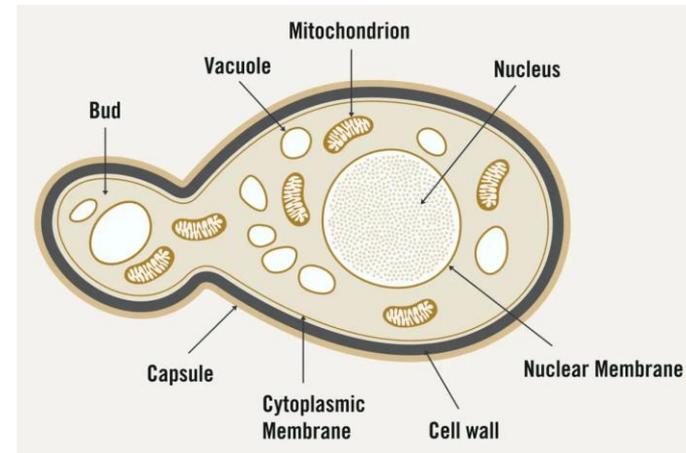
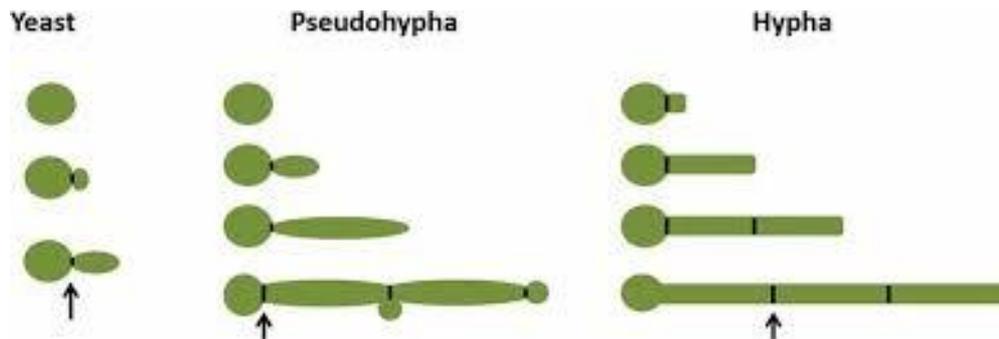
❖ Morphological

1. **Yeasts** (unicellular). *Cryptococcus*
2. Yeast-like which form Pseudohyphae. Like *Candida*
3. **Molds** (filamentous). *Dermatophytes*.
4. **Dimorphic fungi** (exist in both yeast and mold forms depending on temperature/environment).

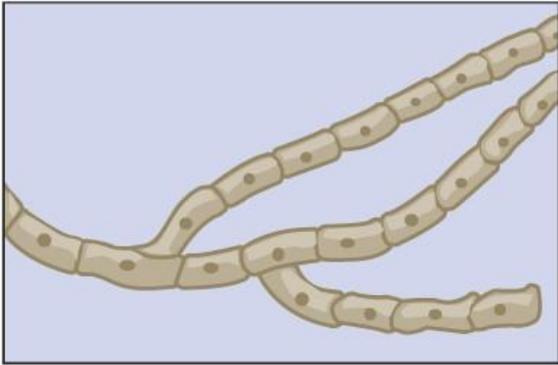
❖ Clinical classification

Yeasts

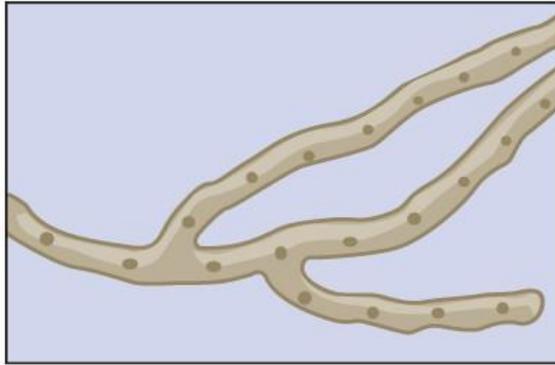
- Single-celled (Unicellular)
- Oval/round
- There are some 1,500 known species of yeasts, but perhaps the most well known is the genus *Saccharomyces* (*saccharo* = “sugar”; *myces* = “fungus”) that is used for bread baking.
- Reproduce by budding.
- e.g: *Saccharomyces cerevisiae*, *Candida albicans*
- Some yeast have elongated budding (Pseudohyphae)



septate hyphae

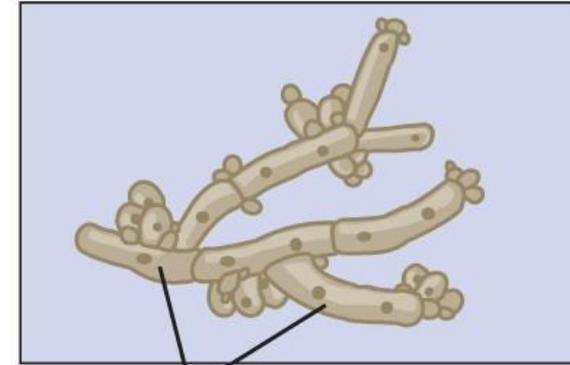


coenocytic (nonseptate) hyphae



molds

pseudohyphae



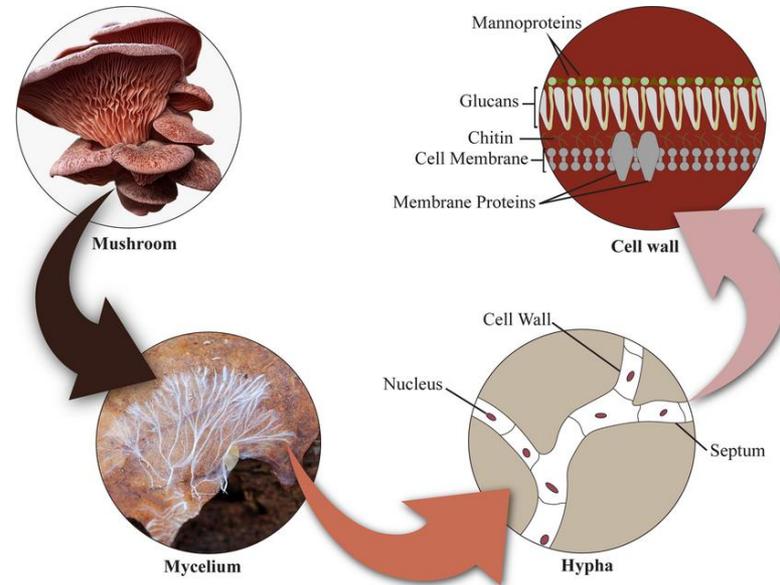
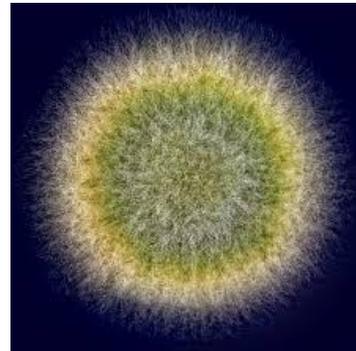
yeast cells

stick together as a short chain or **pseudohypha**

Candida albicans

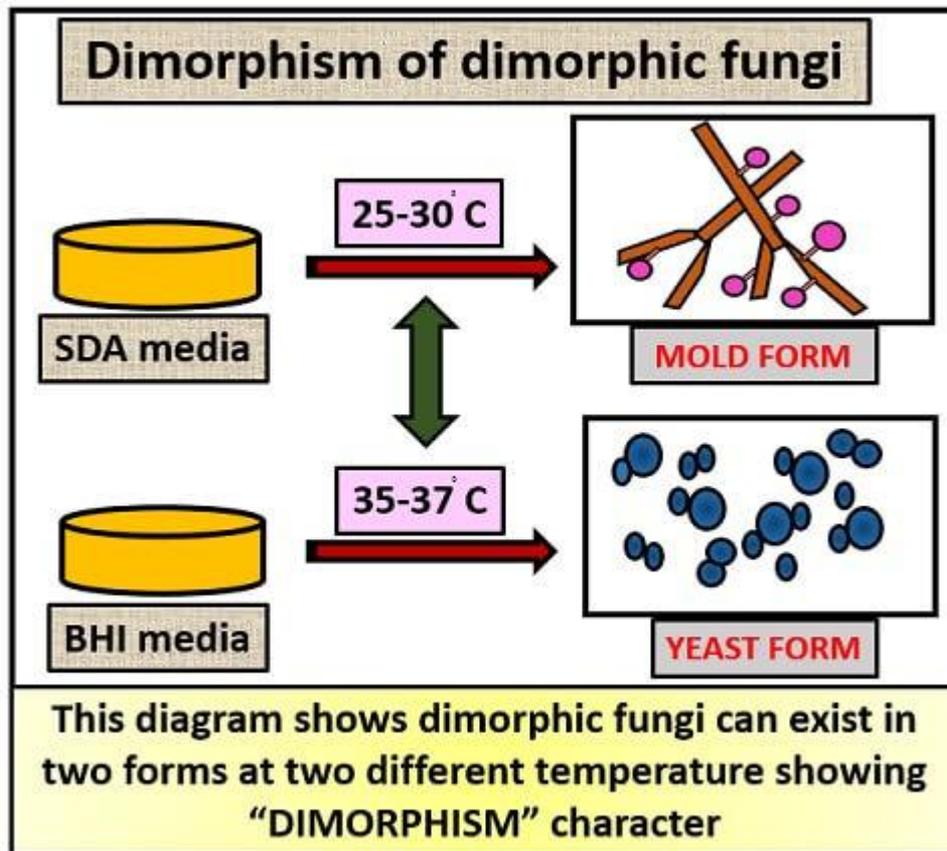
Molds (Filamentous Fungi)

- Multicellular
- Characterized by branching filaments called hyphae (forming a mycelium).
- e.g., (*Aspergillus*, *Penicillium*)



Dimorphic fungi

- Some fungi are dimorphic, having more than one appearance during their life cycle
- Can switch between yeast (at 37C) and mold (at room temperature).
- Pathogenic
- forms (e.g., , *Blastomyces dermatitidis*, *Histoplasma capsulatum*)



SDA (Sabouraud Dextrose Agar)

selective medium used in to isolate and grow fungi (yeasts and molds)

Brain Heart Infusion (BHI) Media

Rich culture medium

Classification of Fungi

❖ Clinical classification

- Most are nonpathogenic to humans and animals, although a few can cause human diseases referred to generally as **mycoses** (singular: **mycosis**).
- Many of these are **opportunistic** pathogens, meaning they only cause disease in people with a weakened immune system.

Clinical classification of Fungi

❖ Based on disease type

- 1. Superficial Mycoses:** Affect outer layer of skin, hair, nails (e.g., *Tinea versicolor*). Well defined margin. Maybe hypopigmented in back skin, hyperpigmented. *Candida albican* in oral.
- 2. Cutaneous Mycoses:** *Dermatophytes*, Infections of the skin, hair, nails (e.g., **Ringworm/ *Tinea cpitis, Tinea pedis***). Types:
 - *Microsporum*
 - *Epidermophyton*
 - *Trichophyton*

Clinical classification of Fungi

❖ Based on disease type

3. Subcutaneous Mycoses: Deeper skin/subcutaneous tissue infections, (e.g., *Microtrauma*) often via trauma and rose pickers disease (e.g., *Sporotrichosis*).



4. Systemic (Deep) Mycoses: Dimorphic, can spread, Involve internal organs, usually via inhalation, (e.g., *Histoplasmosis*).

5. Opportunistic Mycoses: Affect immunocompromised individuals (e.g., *Candida*, *Aspergillus*, *Mucorales*)

Classification of Mycoses

Superficial
Mycoses

Cutaneous
Mycoses

Subcutaneous
Mycoses

Systemic
Mycoses



Clinical classification of Fungi

❖ Mycotoxicosis (Aflatoxin)

- refers to poisoning caused by ingestion of **aflatoxins**, which are toxic secondary metabolites produced mainly by *Aspergillus flavus* and *Aspergillus parasiticus*
- Types of Aflatoxins:
 1. **Aflatoxin B1 (AFB1)** – *most potent, highly carcinogenic*
 2. Aflatoxin B2
 3. Aflatoxin G1
 4. Aflatoxin G2
 5. **Aflatoxin M1** –found in milk
- **Pathogenesis**
- **Aflatoxin B1** is metabolized in the liver to **aflatoxin-8,9-epoxide**, a highly reactive compound that:
 - Binds to **DNA**, causing mutations
 - Leads to **hepatocellular carcinoma (HCC)**

Clinical classification of Fungi

❖ Allergic disorders (Spores of *Aspergillus*)

- The main clinical classification of diseases caused by *Aspergillus* species is a spectrum of disorders, generally divided into **three major categories**:
 1. **Allergic Manifestations:** These occur in individuals with a hypersensitivity response to fungal antigens.
 2. **Chronic (and Saprophytic) Forms:** These usually affect individuals with pre-existing lung diseases (e.g., prior tuberculosis).
 3. **Invasive and Disseminated Disease:** These are life-threatening infections where the fungus invades and destroys tissue (*Histoplasmosis*), typically occurring in severely immunocompromised patients.

Fungi in the Oral Cavity (Mycobiome)

- **Most Common:** *Candida* species (e.g., *C. albicans*, *C. tropicalis*) are found in a majority of **healthy individuals**.
- **Other Frequent Genera:** *Cladosporium*, *Aspergillus*, *Fusarium*, *Cryptococcus*, *Aureobasidium*, *Saccharomyces*, and *Penicillium* are also frequently present in lower abundances.
- Overgrowth or changes in host immunity can lead to oral **candidiasis**
- Certain fungi may protect children against cavity-causing bacteria, *Debaromyces*, *Rhodotorula*, or *Malassezia*.

