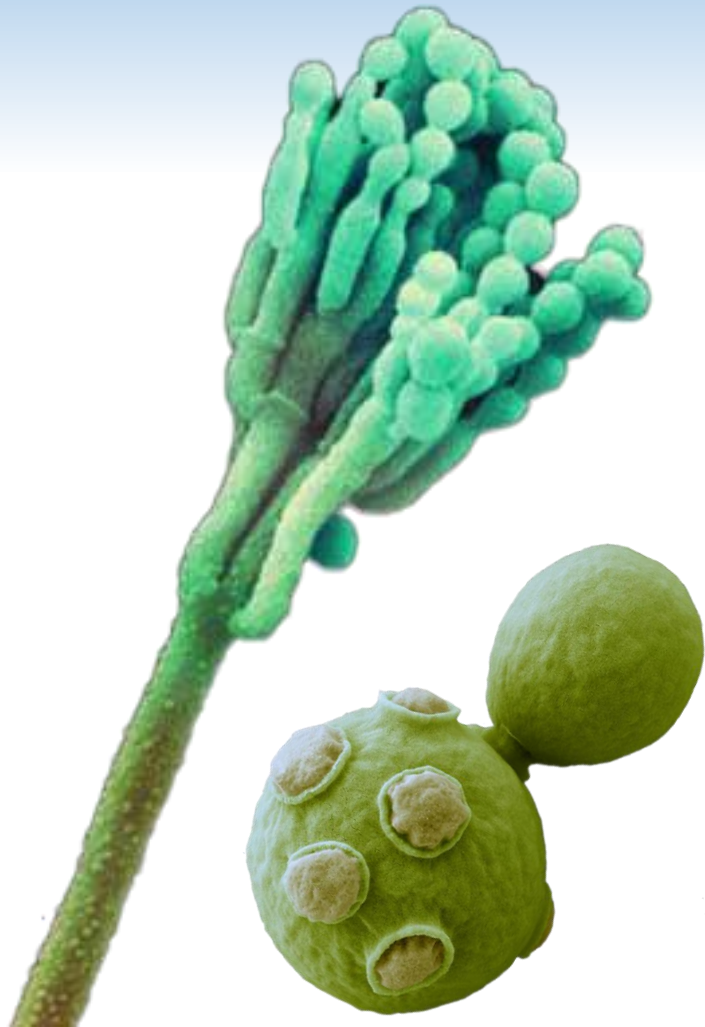


Lecture 9



General Characters of Fungi

Objectives

1. **Define** mycology, mycoses
2. Explain **importance** of harmful and useful fungi and give examples
3. Explain **structure** of fungal cell and compare it with bacterial cell
4. Explain **Heterotrophic** and **absorptive** nutrition of fungi.
5. Explain the different modes of **nutrition** of fungi: (parasitic, symbiotic and saprophytic) and give examples.
6. Classify fungi according to **morphology** (mold, yeast, dimorphic)
7. Illustrate mold **morphology** (hyphae, mycelium, septa)
8. Explain mode of **reproduction** on fungi.



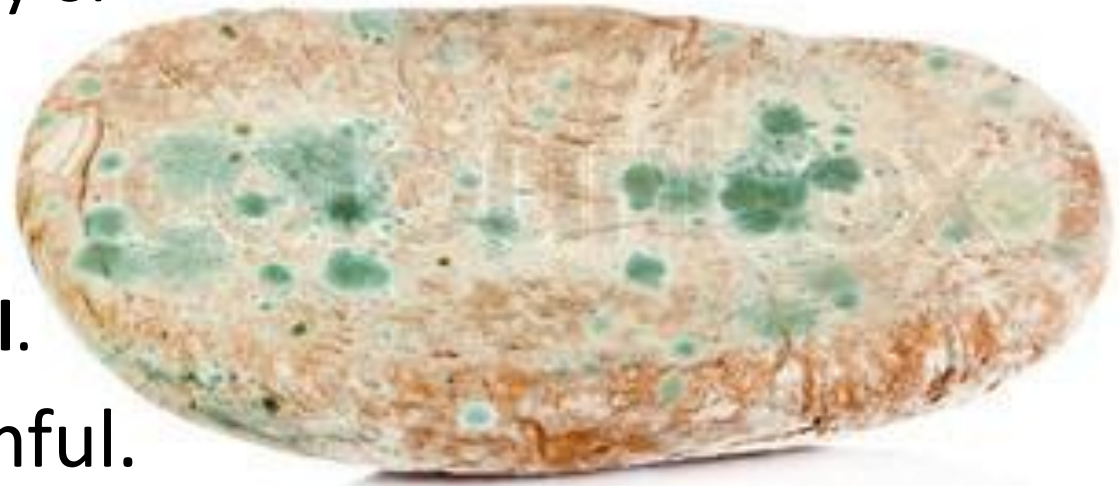
Mycology

- **Mycology** is the Study of Fungi (single Fungus).
- The diseases they cause are called **Mycoses**.

Importance of fungi - harmful fungi

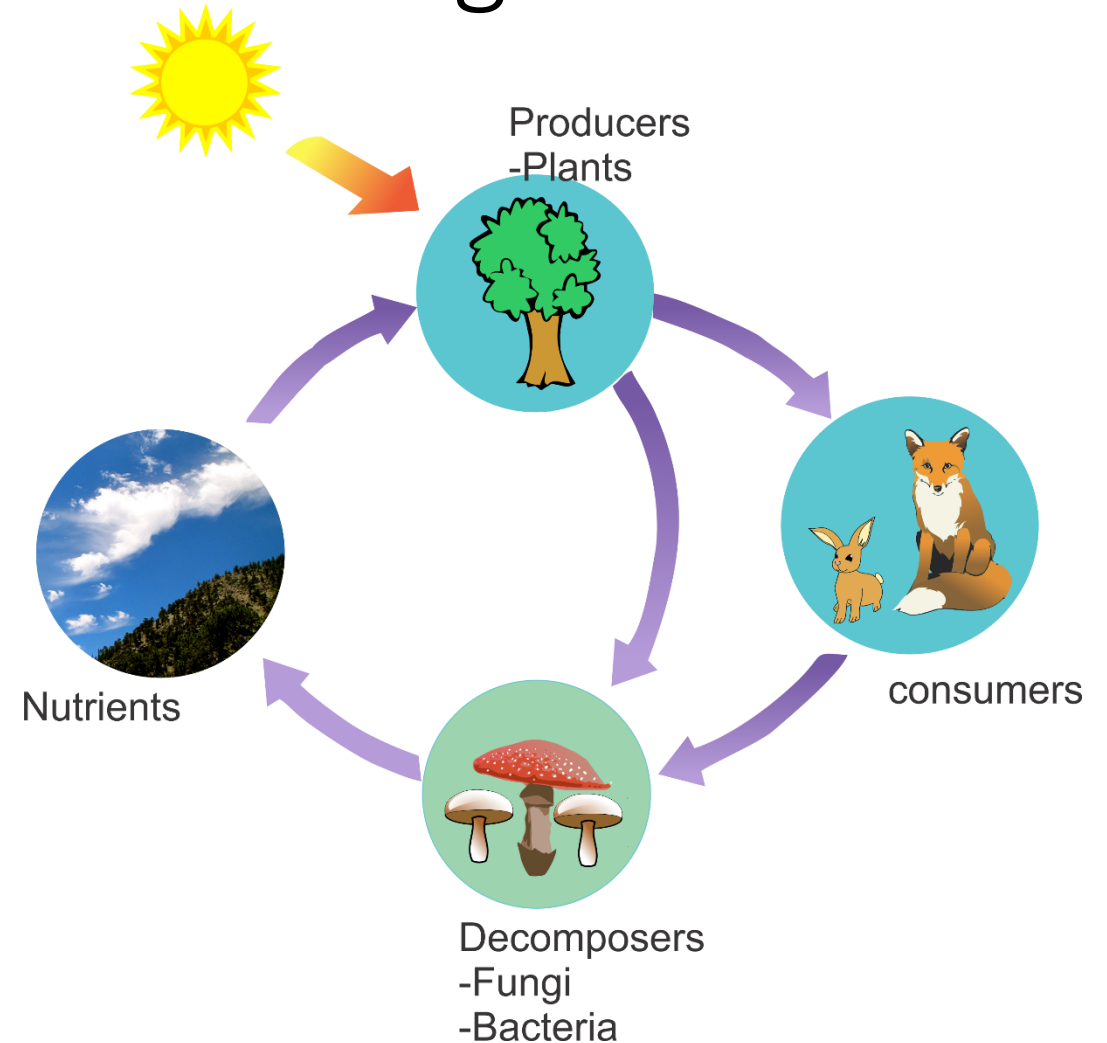
Some Fungi are harmful:

- Some fungi can cause diseases in **humans** and **animals**, either directly or through their toxins.
- Fungi can cause **plant diseases** and **destroy crops**.
- Some fungi cause **foodstuff to spoil**.
- However, most fungi are not harmful.



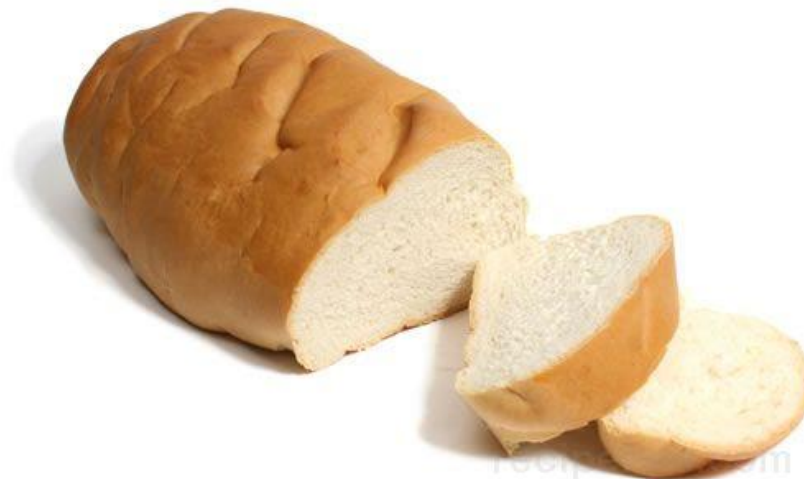
Importance of fungi – useful fungi

In nature, fungi decompose dead organisms (particularly plants) and recycle their **nutrients**.



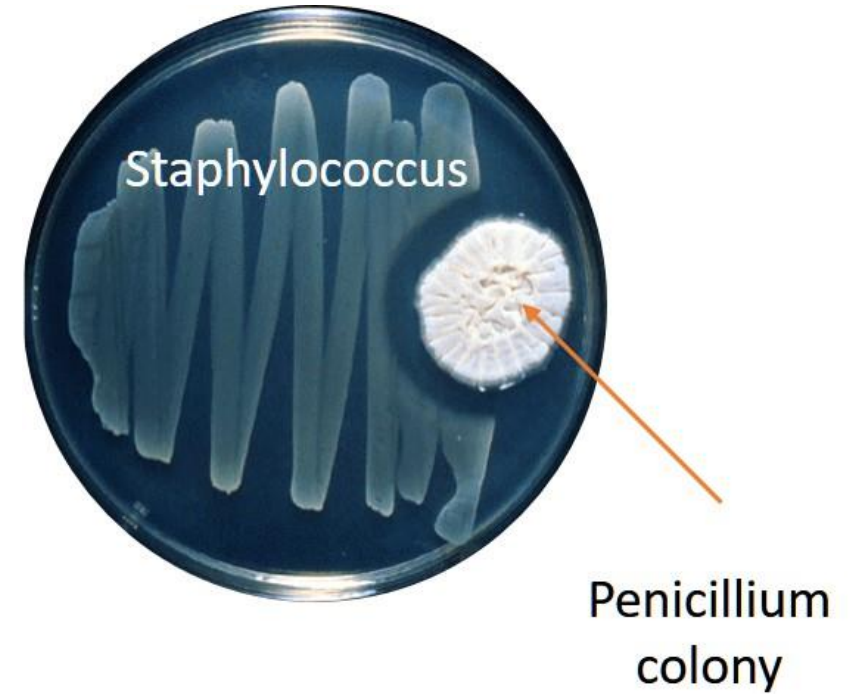
Importance of fungi – useful fungi

- Many **mushrooms** are edible.
- Fungi are used in the production of **bread** and **alcoholic** drinks and some kinds of **cheese**.



Importance of fungi –
useful fungi

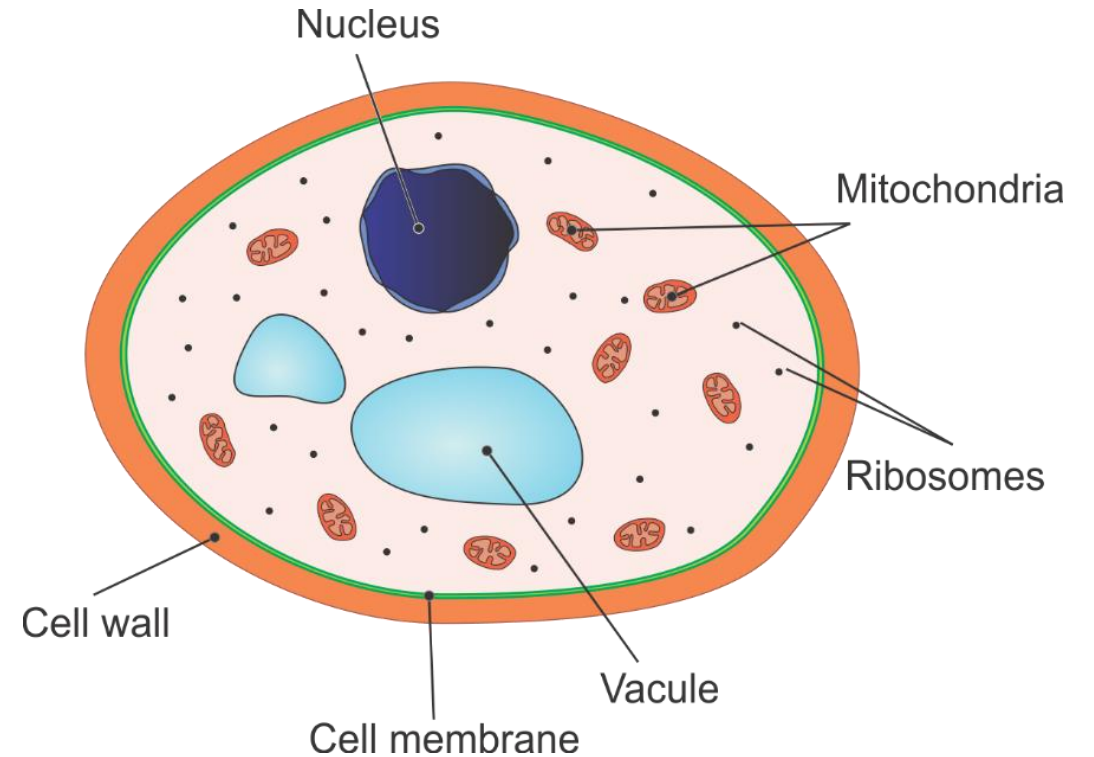
Many antibiotics, including
penicillin, are derived from
fungi.



Cell Structure

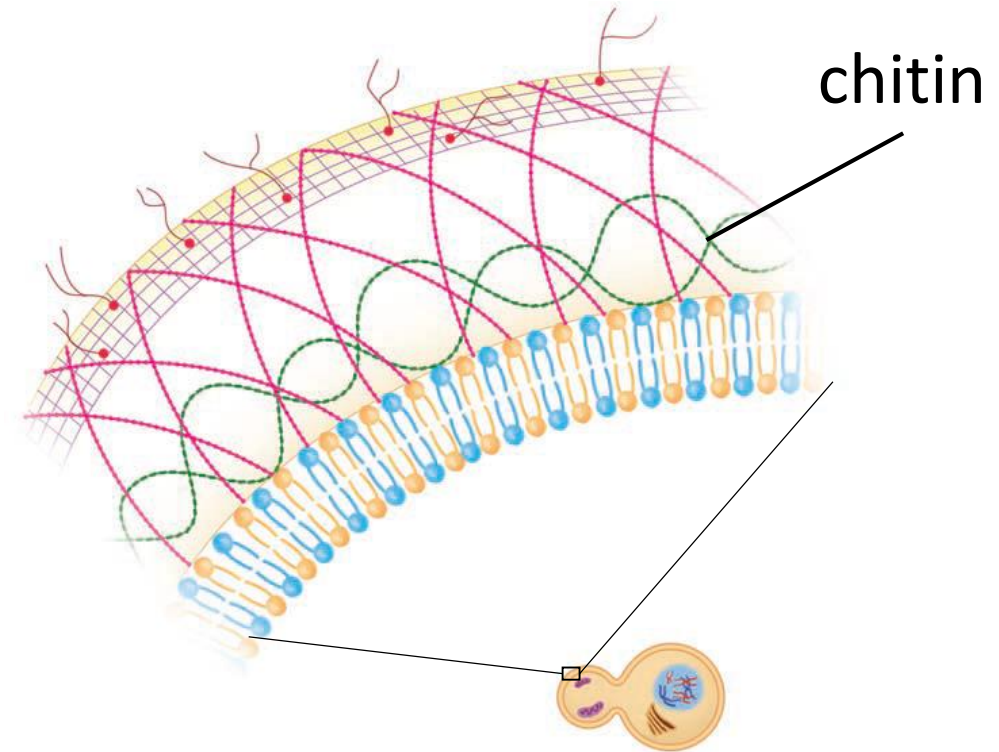
Fungi are Eukaryotic

- Fungus cell contains a **true** membrane-bound nucleus.
- Fungi have **membrane-bound organelles** such as mitochondria, endoplasmic reticulum, and the Golgi apparatus.



Fungal Cell wall

- Fungi have a rigid **cell wall** external to the cytoplasmic membrane.
- Fungal cell wall contain **chitin** (also found in insects)
- Unlike bacteria, Fungal cell wall doesn't contain **peptidoglycan**.
- Unlike plants, Fungal cell wall doesn't contain **cellulose**.

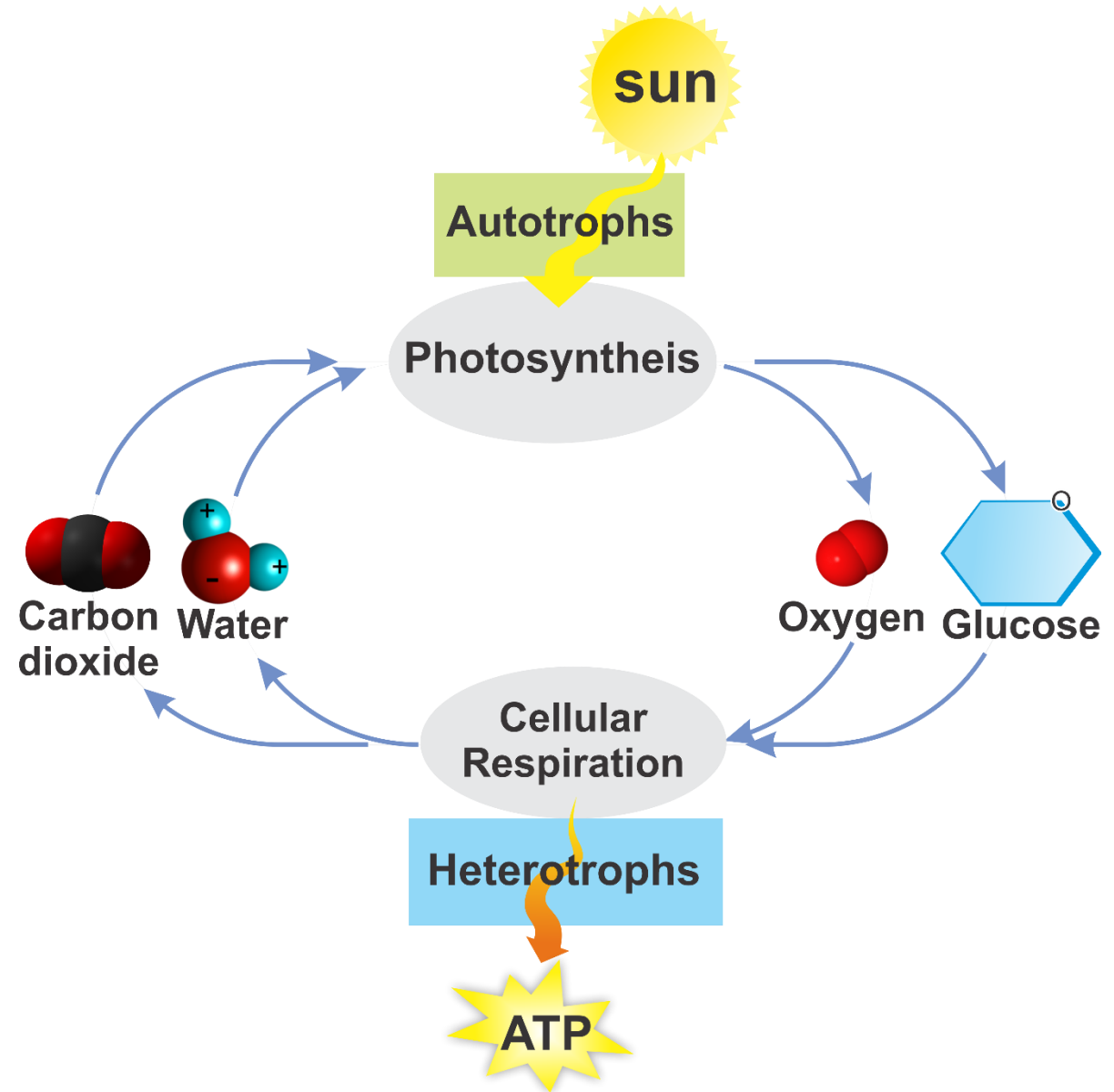


Fungi differ from bacteria

Fungi	Bacteria
Fungi are eukaryotic cell	Bacteria are prokaryotic
Fungal cell wall contain chitin	Bacterial cell wall contain peptidoglycan
Fungi may be unicellular (yeast) or multicellular (mold)	Bacteria are unicellular
Fungi can reproduce both sexually or asexually	Bacteria reproduce asexually via binary fission

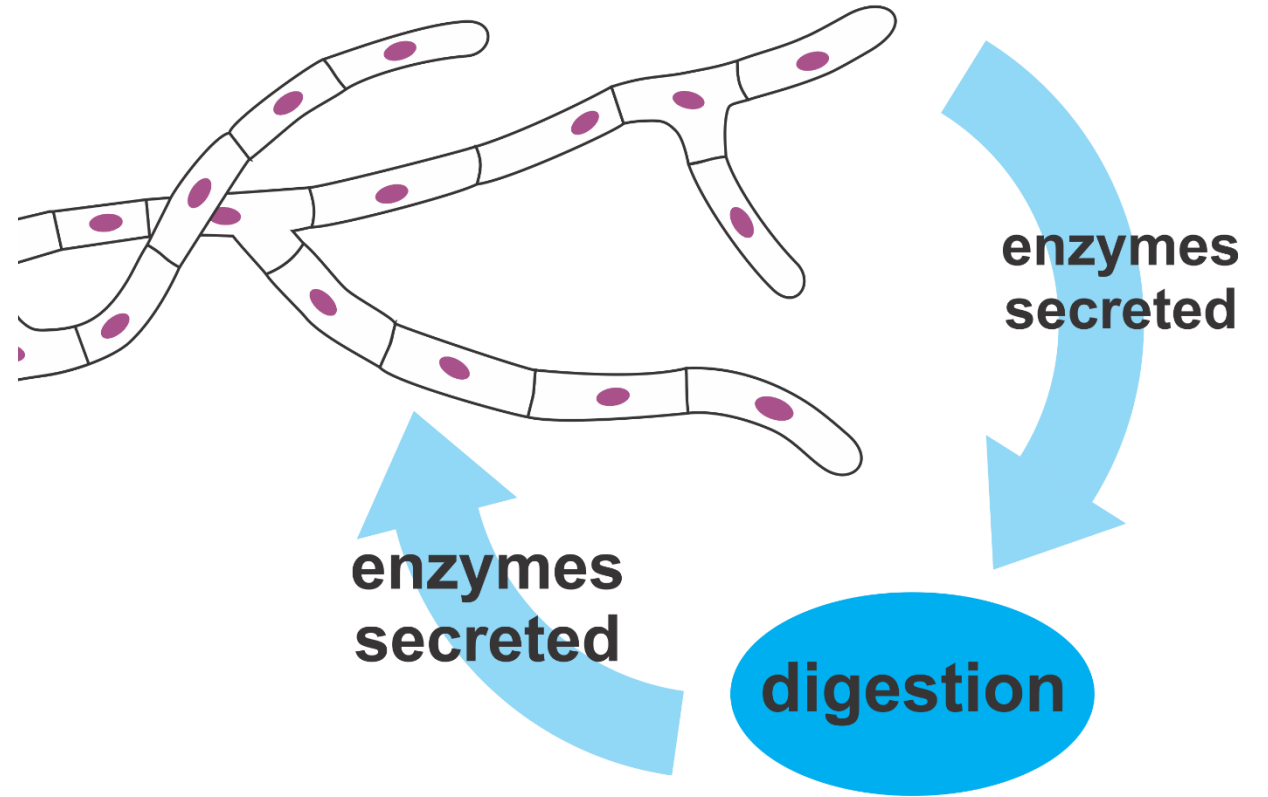
Fungi are *Heterotrophs*

- Fungi lack chlorophyll and do not perform photosynthesis.
- Fungi are **Heterotrophs**. They use **organic** compounds as carbon source.
- Plants are **autotrophs**. They use CO_2 as carbon source



Absorptive nutrition

- Fungi acquire nutrients by **absorption**;
- Fungi secrete **catabolic enzymes** outside their bodies to break large organic molecules into smaller molecules,
- The smaller molecules are then **absorbed** through the cell membrane.



Classification of fungi according to nutrition

Fungi can be:

1. **Saprophytic**: decompose **dead** organic matter.
2. **Parasitic**: feed on **living** hosts (causing **disease**).
3. **Mutualistic symbiotic**: Obtaining their nutrients from a **living** host while providing some **benefit** to that host.

1. Saprophytes

- Saprophytic fungi are the largest group of fungi.
- They grow on dead organic matter such as fallen trees, dead leaves.
- Saprophytic fungi play an important role in decomposition of organic matters and nutrition cycling.



2. Parasitic fungi

- **Parasitic fungi** obtain nutrients from living hosts.
- **They** cause **disease** in the host.
- Example:
Ringworm is a fungus that parasitically lives on the surface of human skin.



3. Mutualistic symbiotic fungi

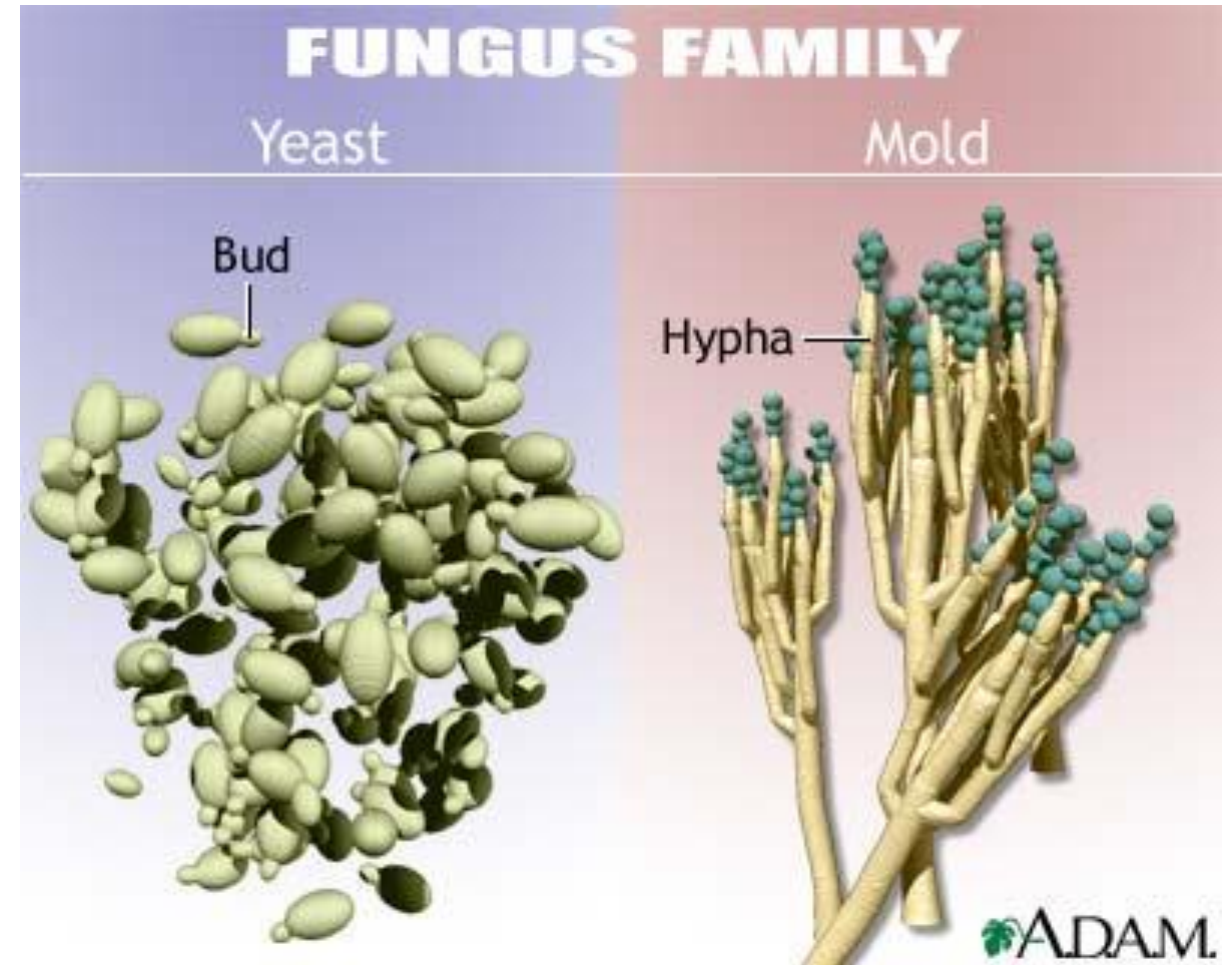
- Obtaining their nutrients from a **living** host while providing some **benefit** to that host
- Mycorrhiza is an example of symbiotic relationship. In this **fungus hyphae** are associated with roots of **plants**.



Fungal Morphology

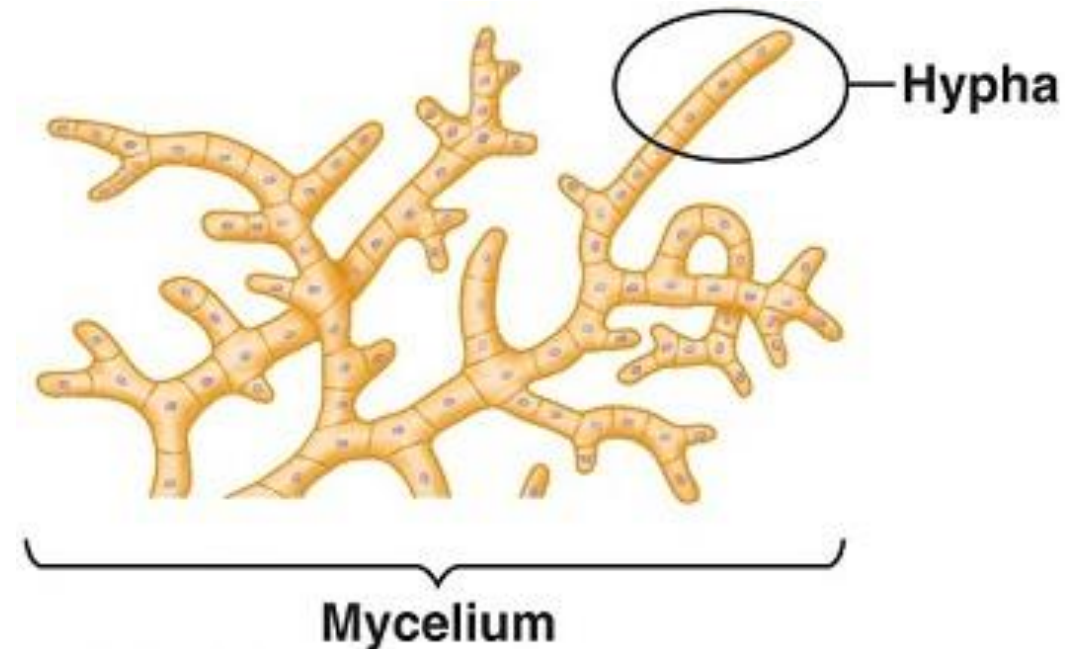
Fungi grow in two basic morphological forms:

- ➊ Molds
 - ➋ Yeasts (Budding fungi).
- In addition some fungi are
- ➌ Dimorphic (can switch between yeast and mold forms).



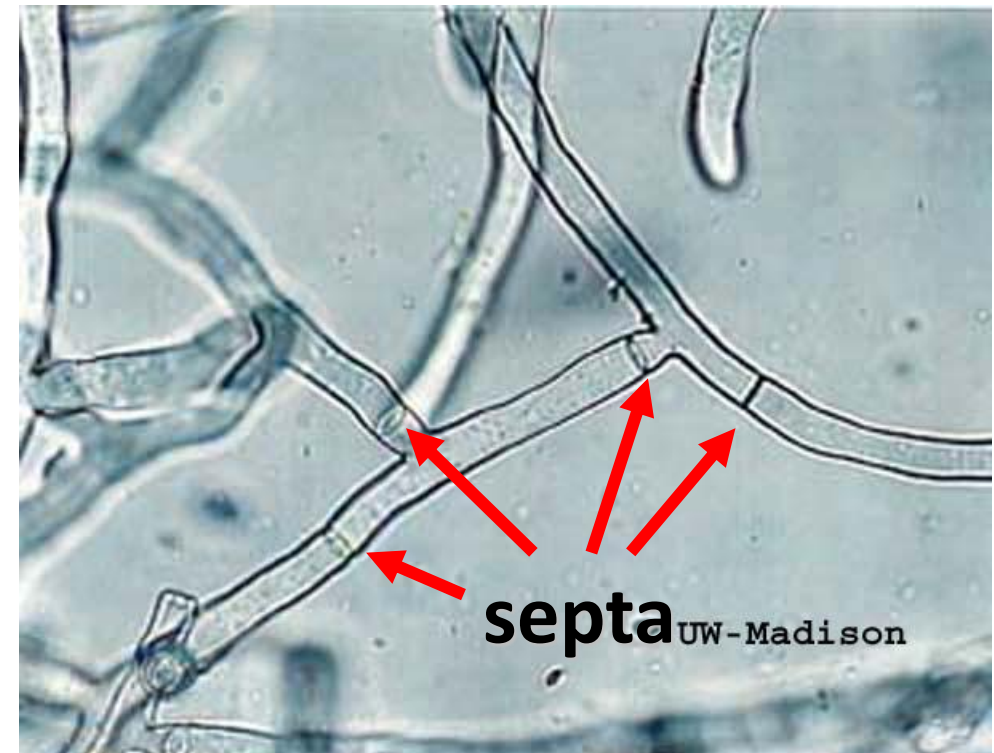
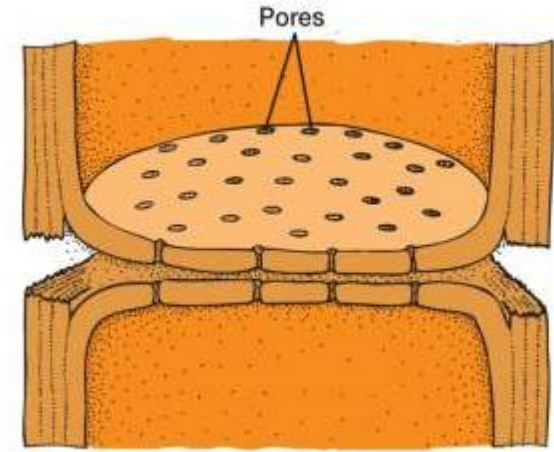
(1) Molds (filamentous fungi)

- Growth in the mold form occurs by production of **Hyphae**.
- Hyphae are long tubular branching filaments of fungal cells.
- The mass of intertwined hyphae that accumulates during active growth is a **mycelium**.



Hyphae and Septa

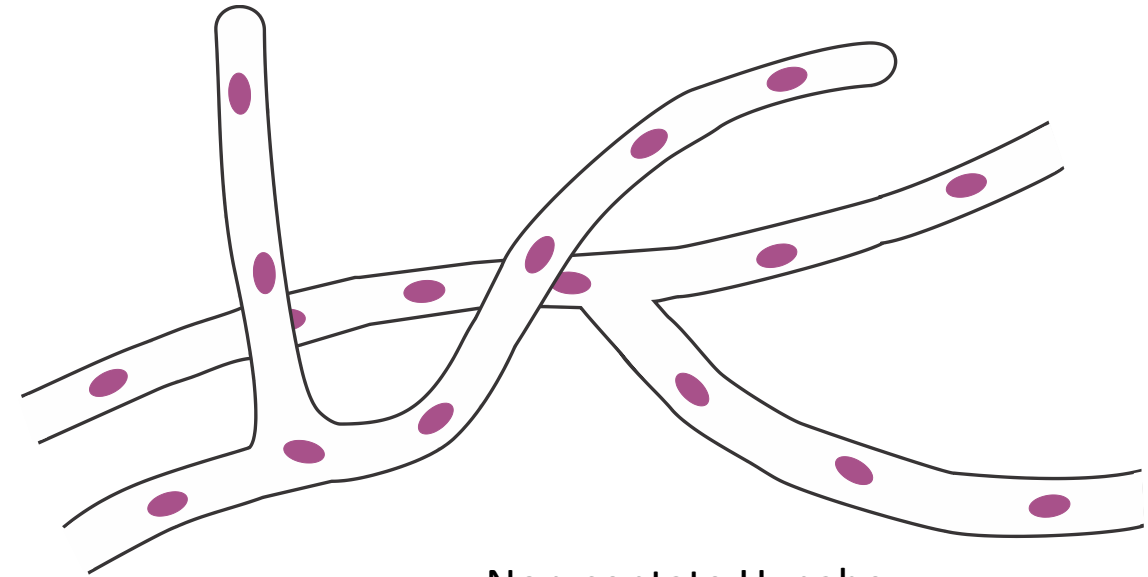
- Individual strands of mycelium are called hyphae (single: hypha).
- In some fungi, hyphae are partitioned into cells by cross walls called **septa** (single: septum).



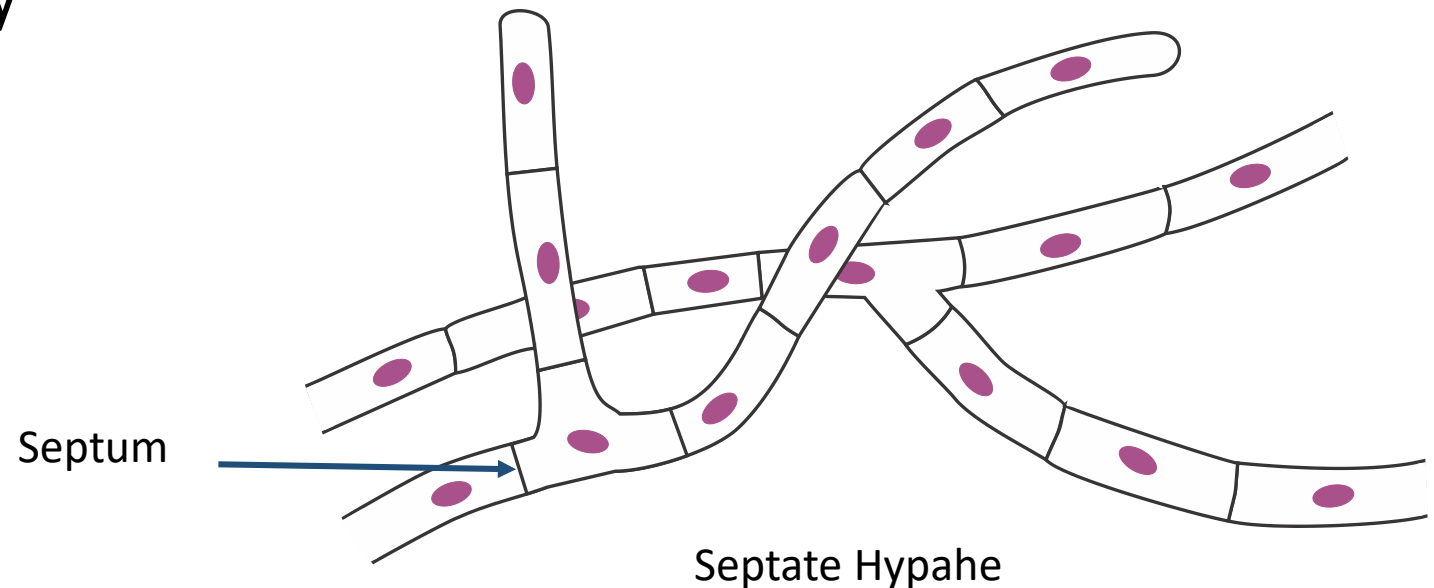
Septated / non septated

According to the presence of septa, hyphae are either:

- **Septate** (divided into cells by septa) or
- **Non-septate** (not divided by septa).



Non-septate Hypahe

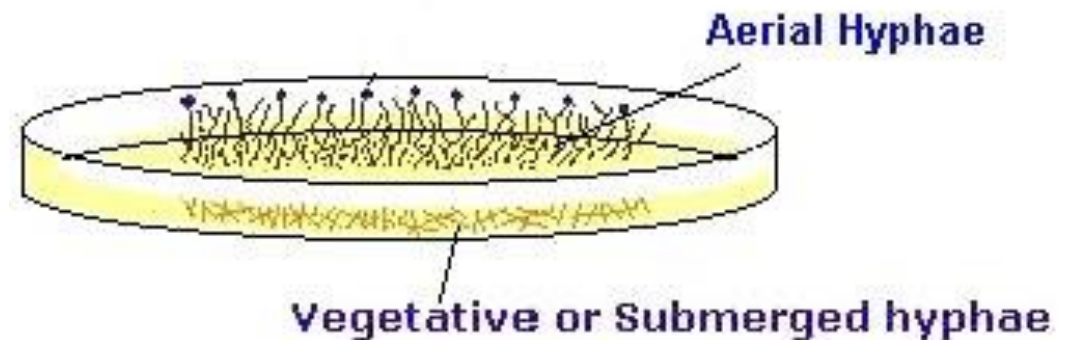


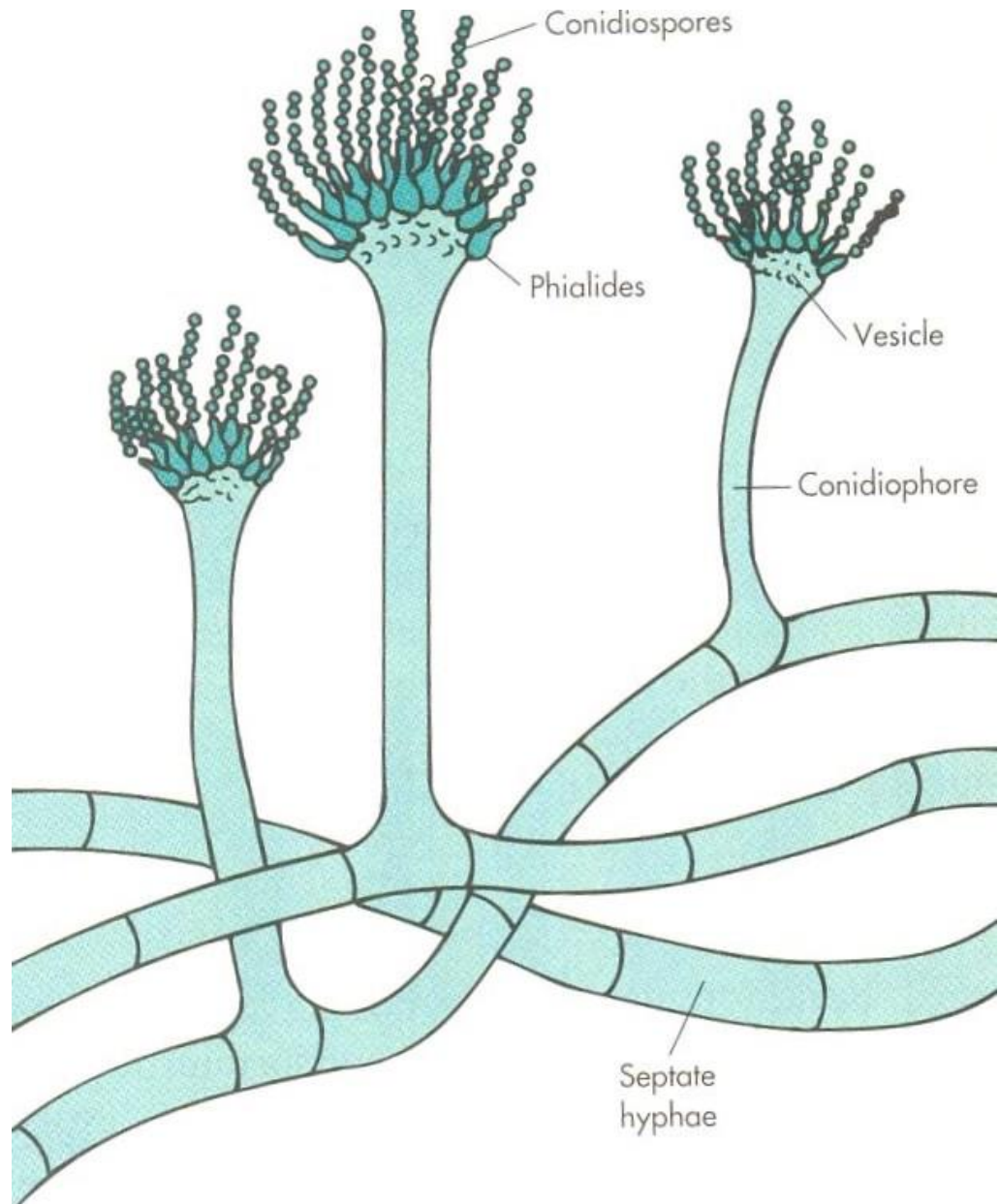
Septum

Septate Hypahe

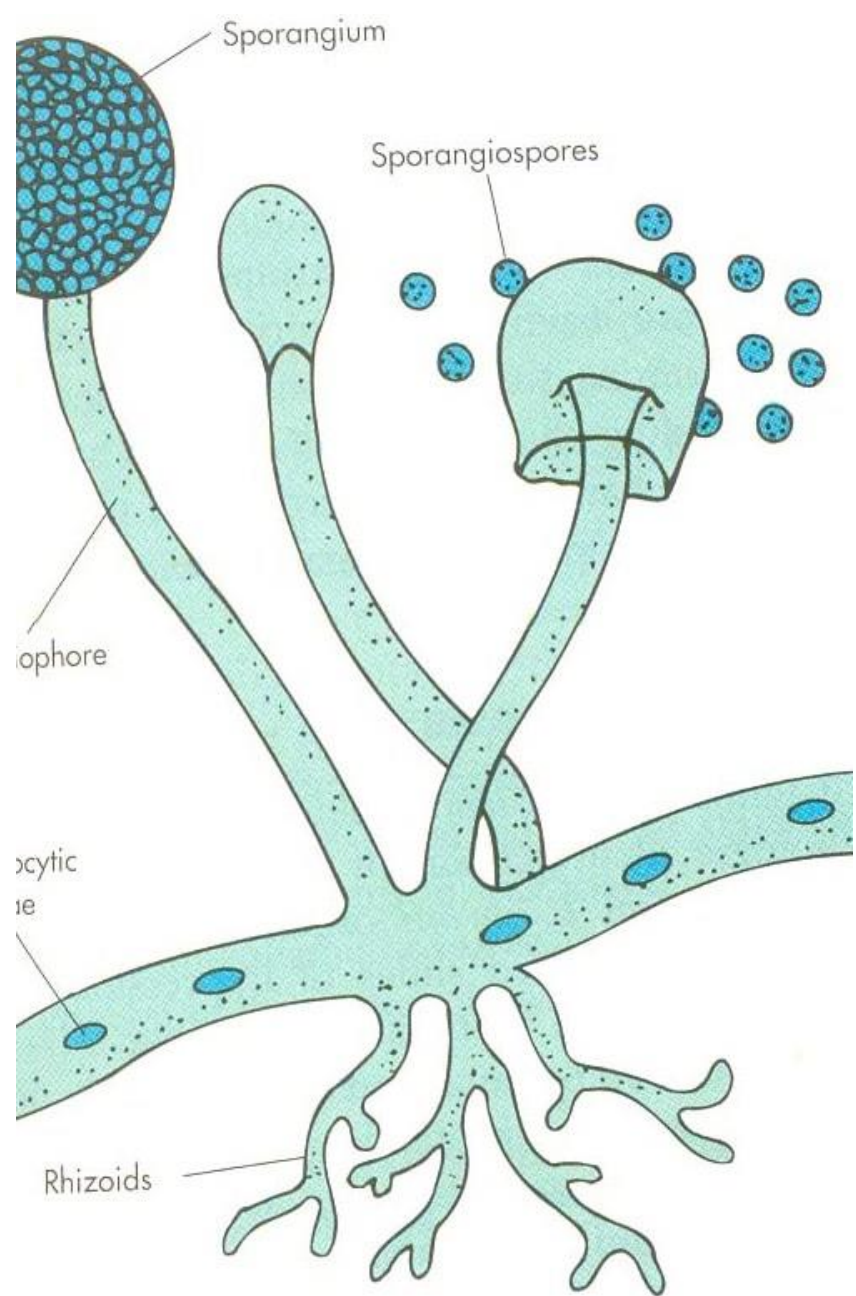
Substrate / aerial hyphae

- Hyphae that penetrate the supporting medium and absorb nutrients are the **vegetative** or **substrate hyphae**.
- In contrast, **aerial hyphae** project above the surface of the mycelium and usually bear the reproductive structures of the mold.





Septate hyphae



Non-Septate hyphae

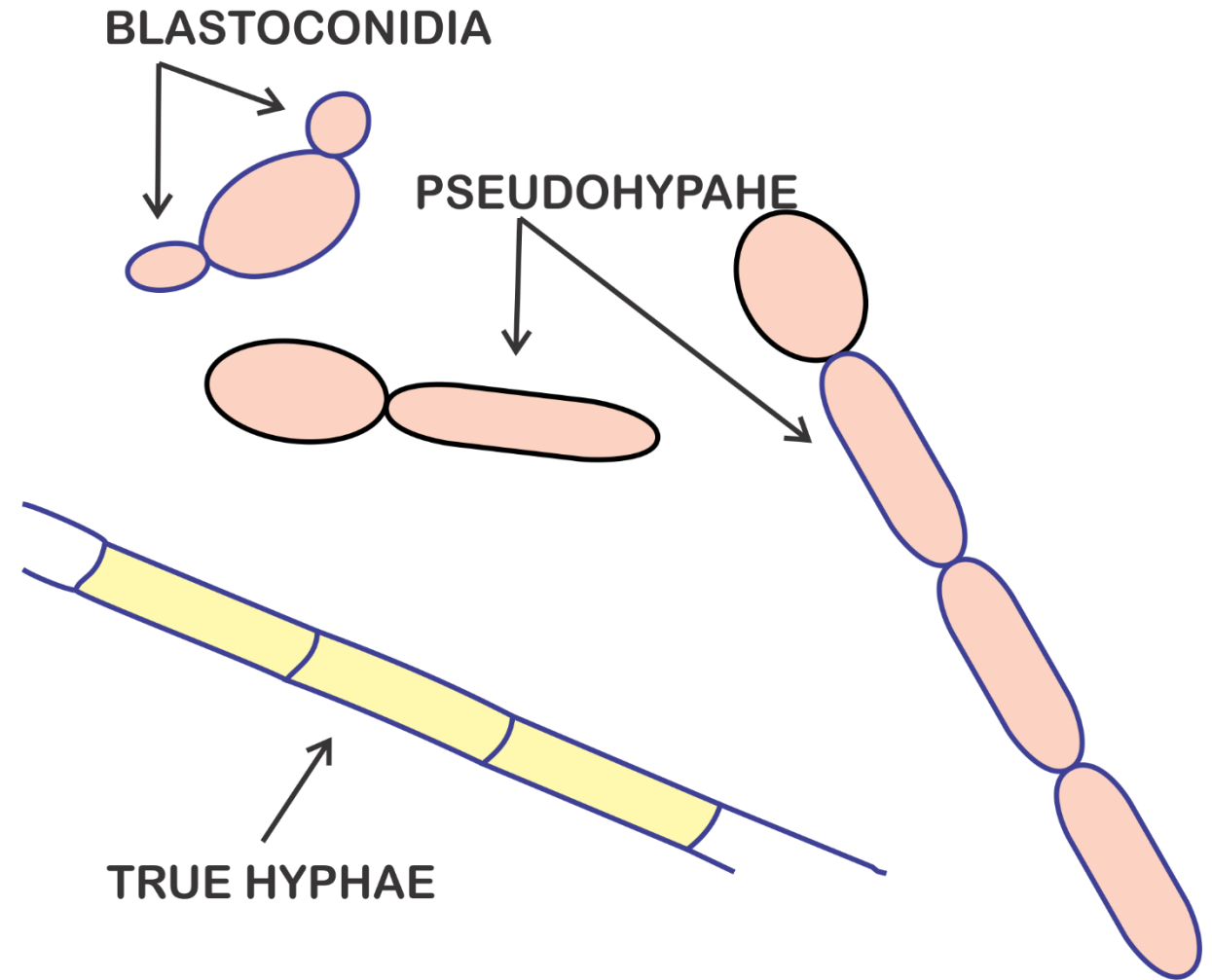
(2) Yeast

- Unicellular fungi.
- Usually spherical or oval in shape.
- Most yeasts reproduce by **budding**.



Pseudohyphae

Some species produce **buds** that characteristically fail to detach and become elongated → continuation of the budding process then produces a **chain** of elongated yeast cells called **pseudohyphae**.

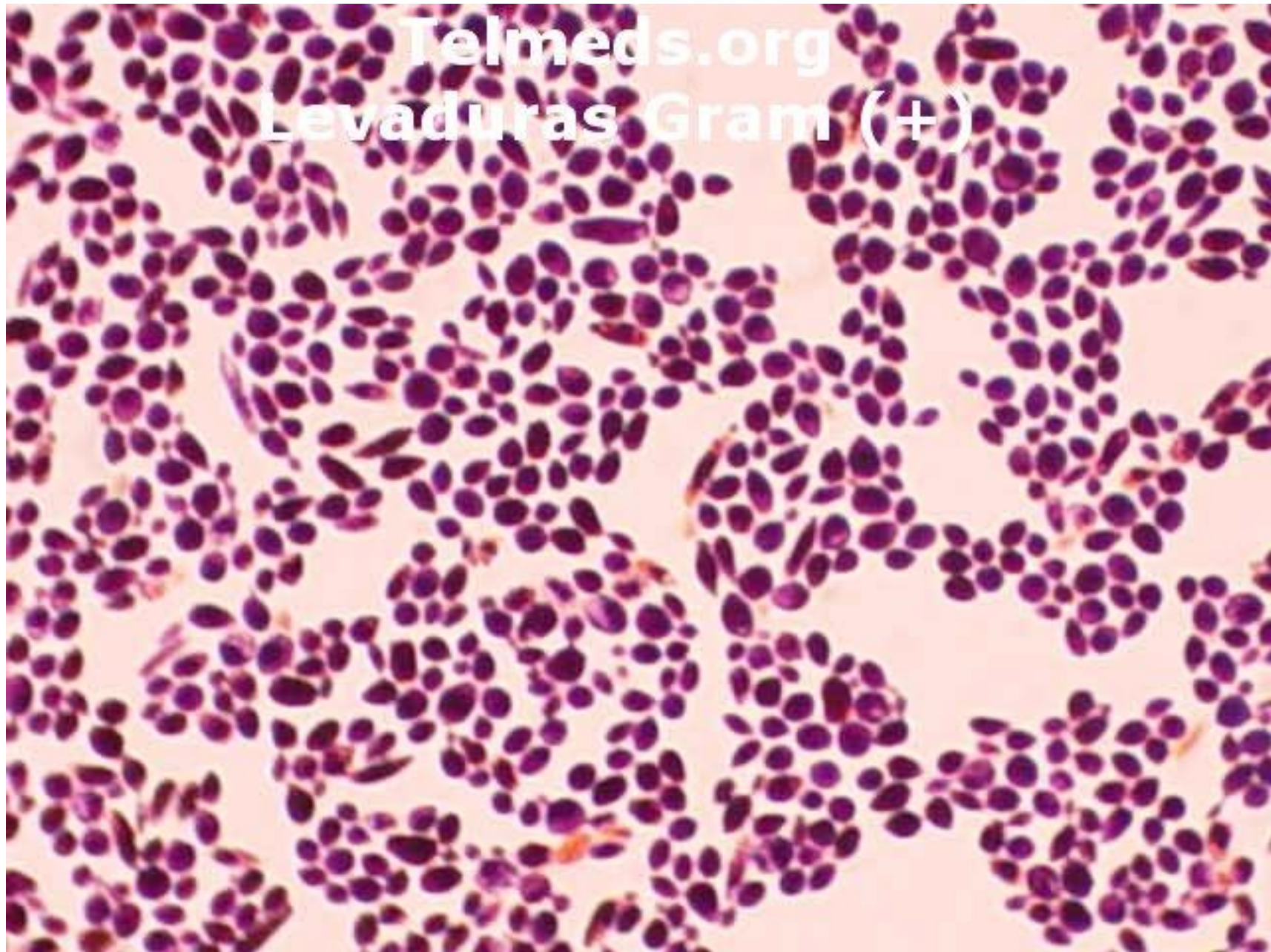


Yeast

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Telmeds.org
Levaduras Gram (+)



(3) Dimorphic fungi

Some species of fungi are dimorphic and capable of growth as a **yeast** or **mold** depending on environmental conditions:

- In nature or when incubated at 25°C they occur in a **mold** form.
- In infected tissues or when incubated at 37C they occur in a **yeast** form.

Fungal Reproduction

Fungal Reproduction

Fungi can reproduce asexually and/or sexually.



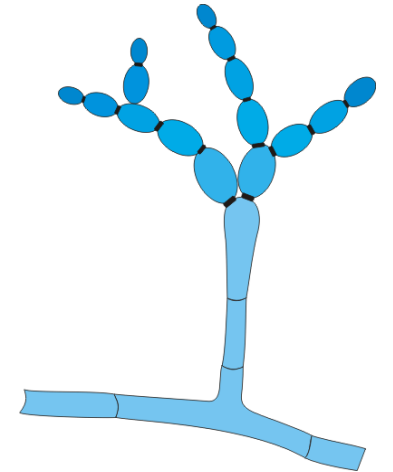
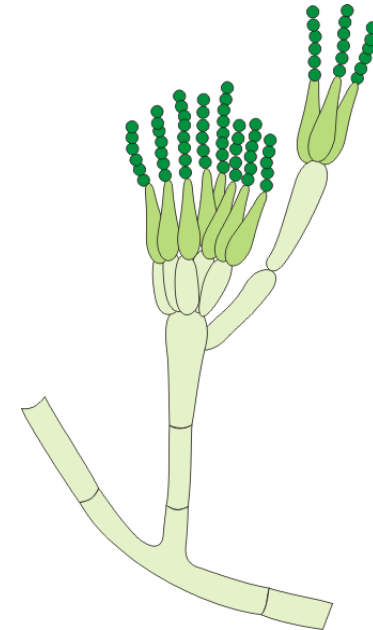
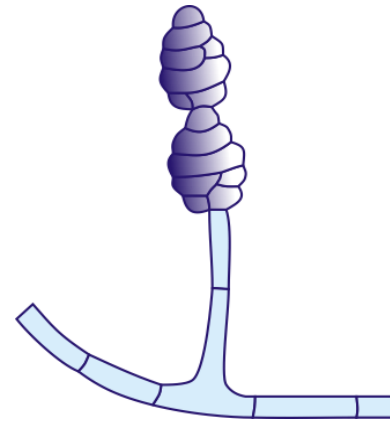
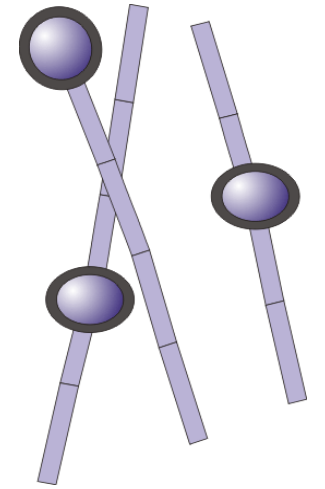
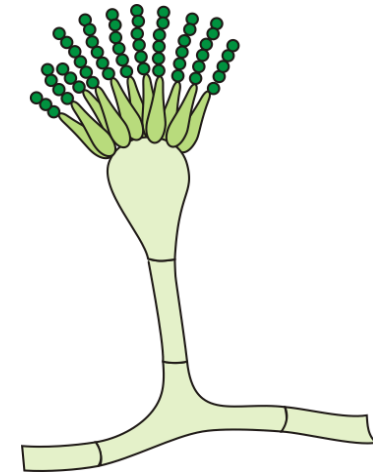
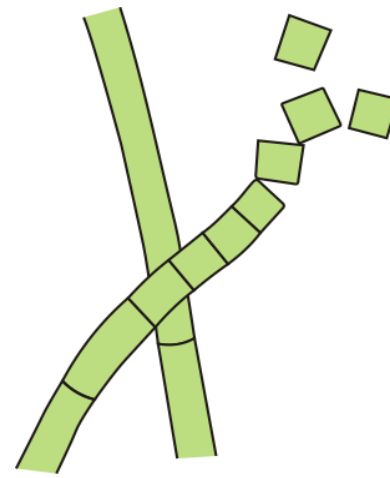
Fungal Spores

- Fungi most commonly reproduce by the formation of **spores**.
- **A Spore is:** a reproductive cell that is capable of growing into a new organism by mitotic division alone.

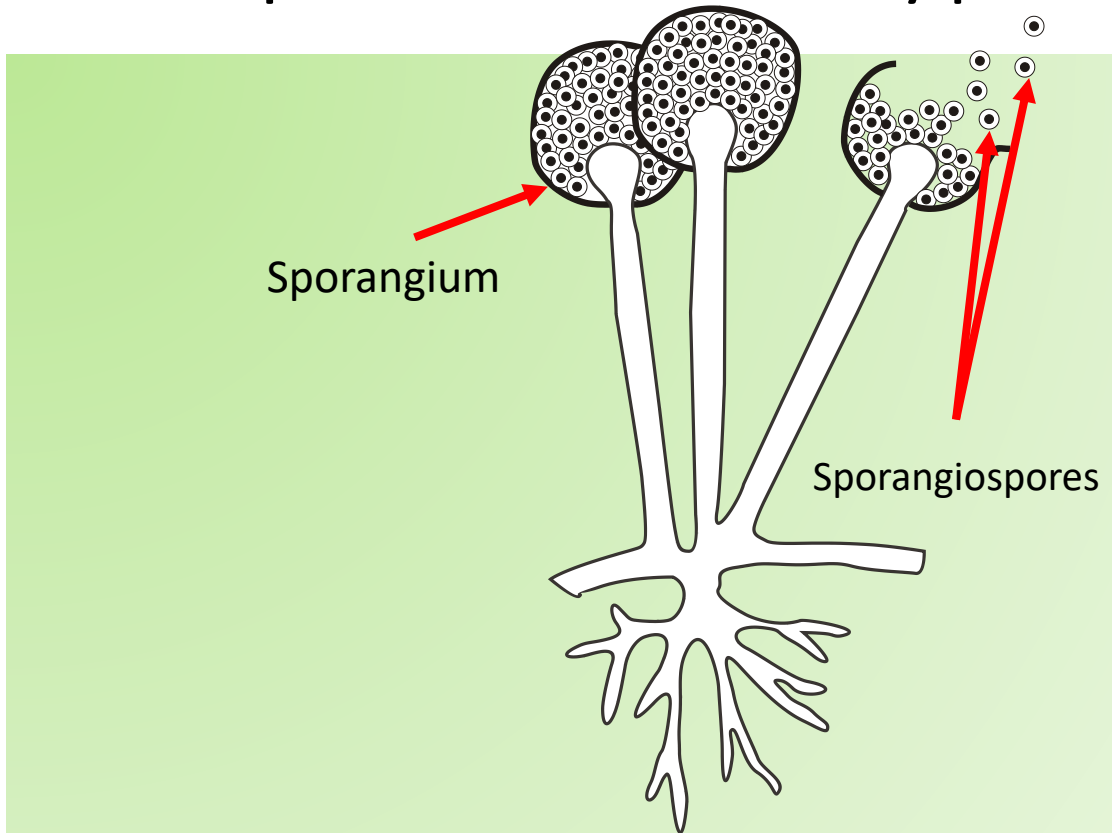


Fungal Spores

The type of spore and the way in which they develop are important in identification and classification of the different species of fungi.

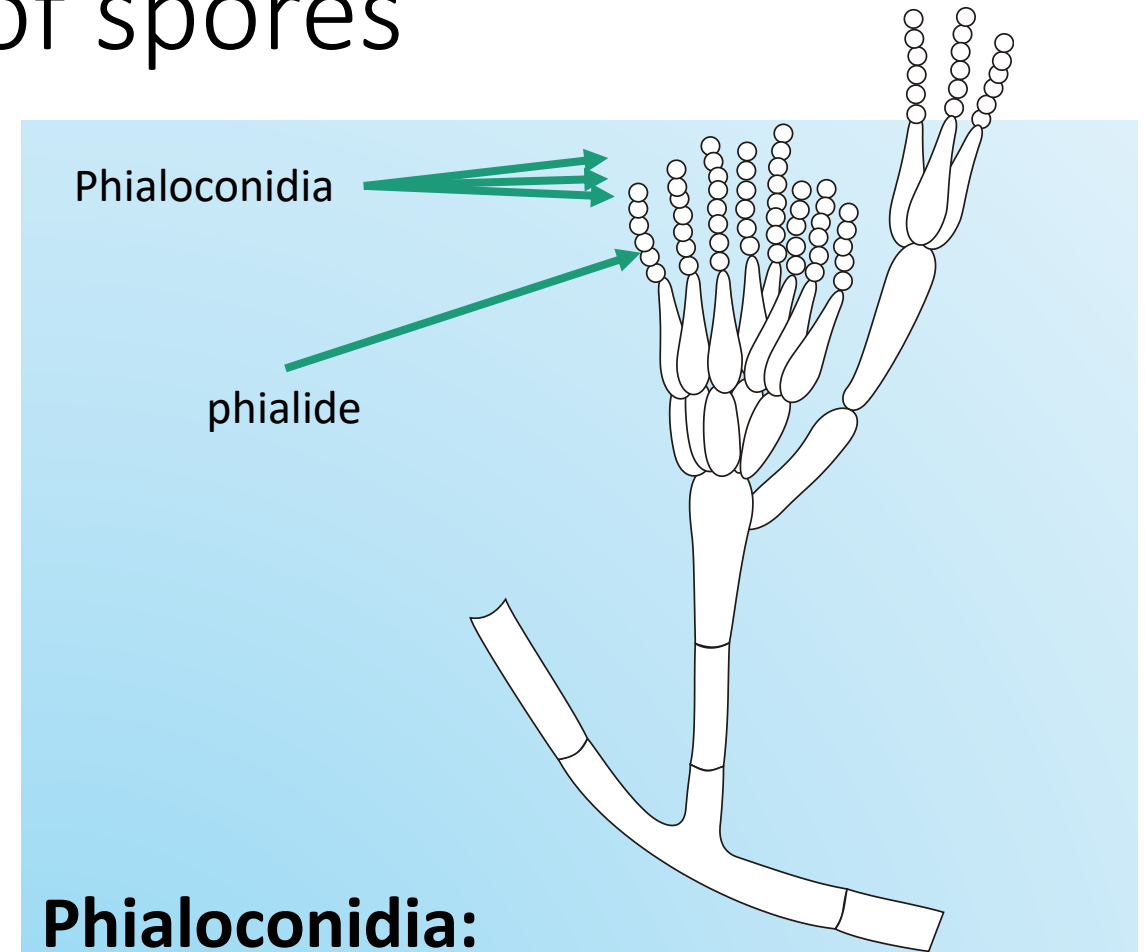


Example of Some Types of spores



Sporangiospores:

- Spores that are produced within a sac called a sporangium.

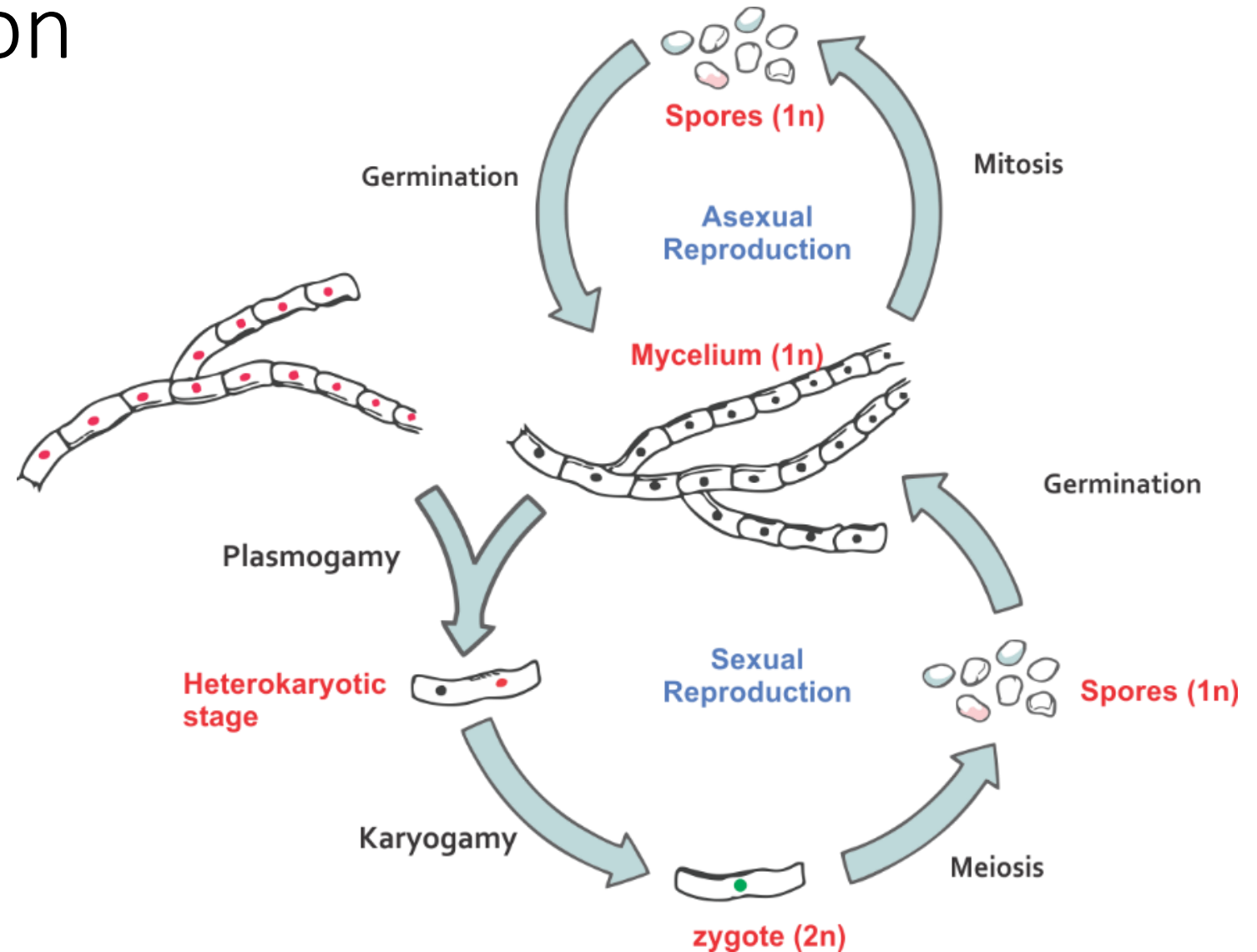


Phialoconidia:

- Conidia that are produced by a "vase-shaped" conidiogenous cell termed a **phialide**.

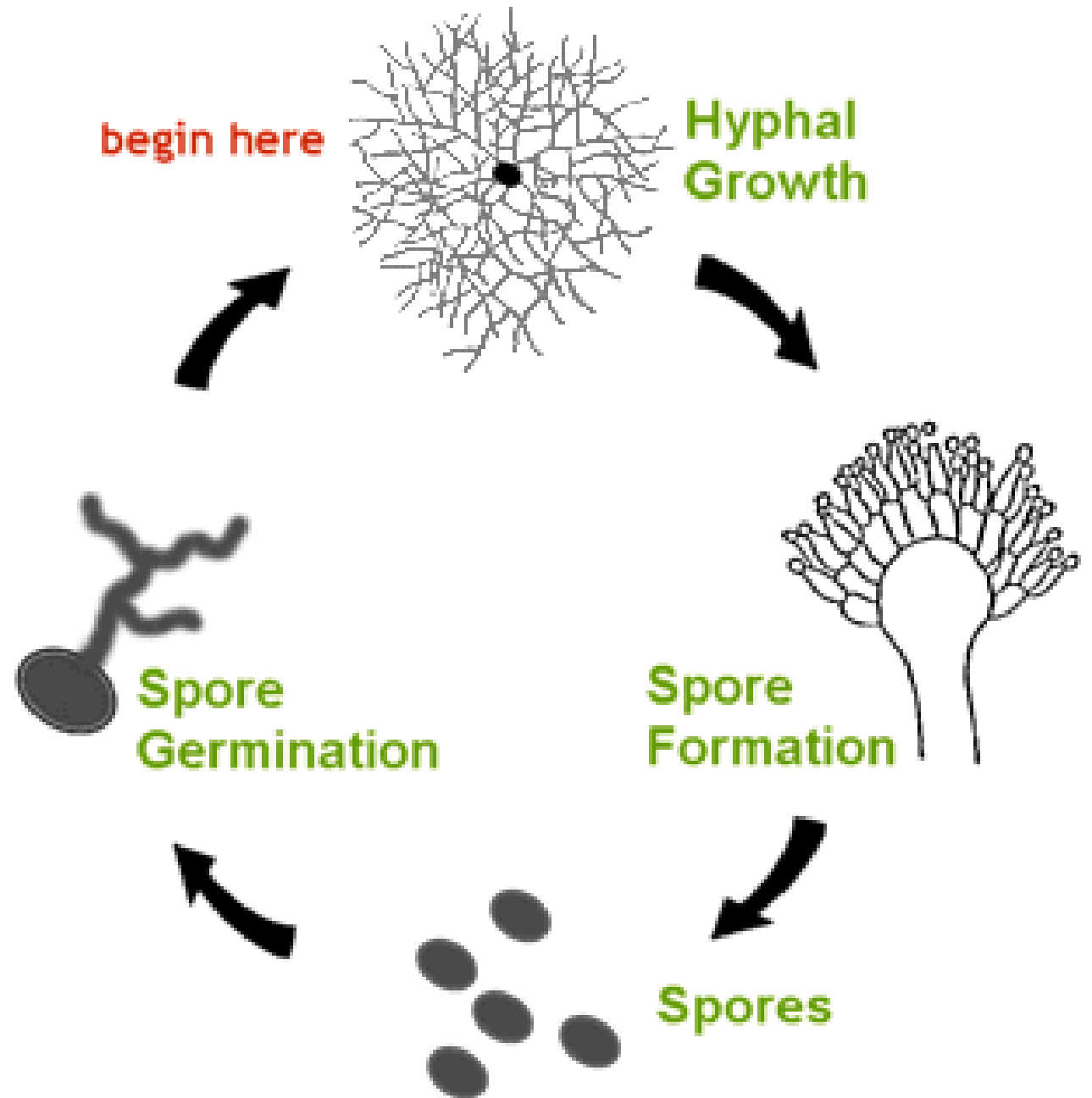
Mold Reproduction

- Molds reproduce by producing large numbers **spores**.
- Spores can be produced either from **asexual** or **sexual** reproduction.



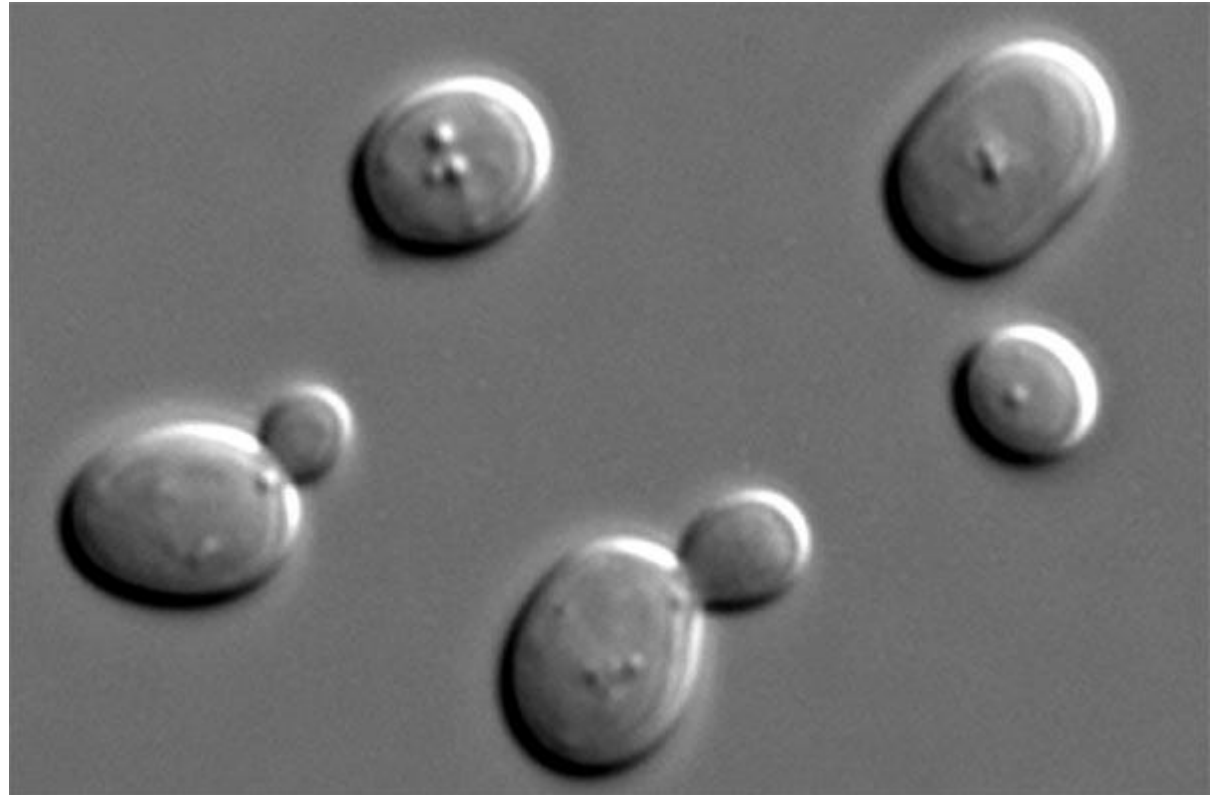
Asexual Life Cycle of Mold

- Hyphal Growth.
- Spore Formation.
- Spore Dispersal.
- Spore Germination.



Yeast Reproduction

Yeast usually reproduce asexually through budding process.



Quizzes



1. Fungi are

A. Prokaryotes

B. Eukaryotes





2. All of the following regarding fungi are True Except _____

- A. Fungi has a true nucleus
- B. Fungi are surrounded by cell wall that contain chitin
- C. Fungi are autotrophs
- D. Fungi can reproduce either sexually or a asexually





3. All of the following regarding yeast is True Except: _____

- A. Yeast cell are spherical or oval
- B. Yeast are unicellular fungi
- C. Yeast commonly reproduce by budding
- D. Yeast cells can grow by production of hyphae.





4. Fungal cell wall contain _____?

- A. Chitin
- B. Peptidoglycan
- C. Cellulose



5. Fungi that decompose dead organic matter are:

- A. Saprophytic
- B. Parasitic
- C. Mutualistic symbiotic



6. Fungi that cause animal or human disease are:

- A. Saprophytic
- B. Parasitic
- C. Mutualistic symbiotic



7. The modes of nutrition of fungi and plants:

- A. Fungi are autotrophs while plants are heterotrophs
- B. Fungi are heterotrophs while plants are autotrophs
- C. Both fungi and plants are autotrophs
- D. Both fungi and plants are heterotrophs



8. The mass of intertwined hyphae that accumulates during mold growth is called _____:

- A. Colony
- B. Mycelium
- C. Sporangium
- D. Rhizoids



9. Long tubular branching filaments of fungal cells are called _____:

- A. Hyphae
- B. Flagella
- C. Yeasts
- D. Spores



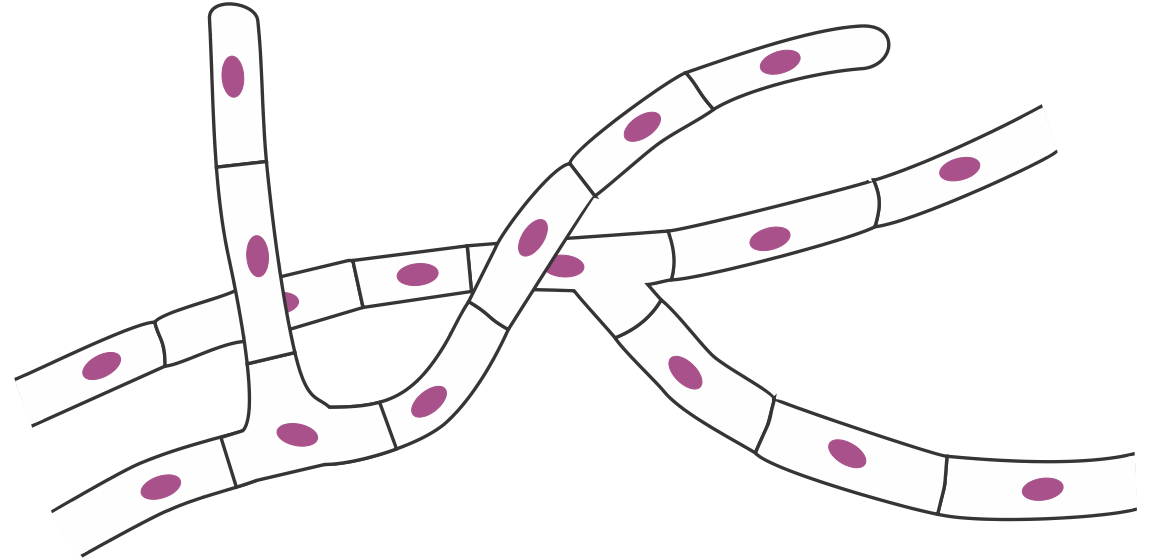
10. Study the diagram and answer:

The type of this Fungus is:

- A. Mold
- B. Yeast

This fungus is:

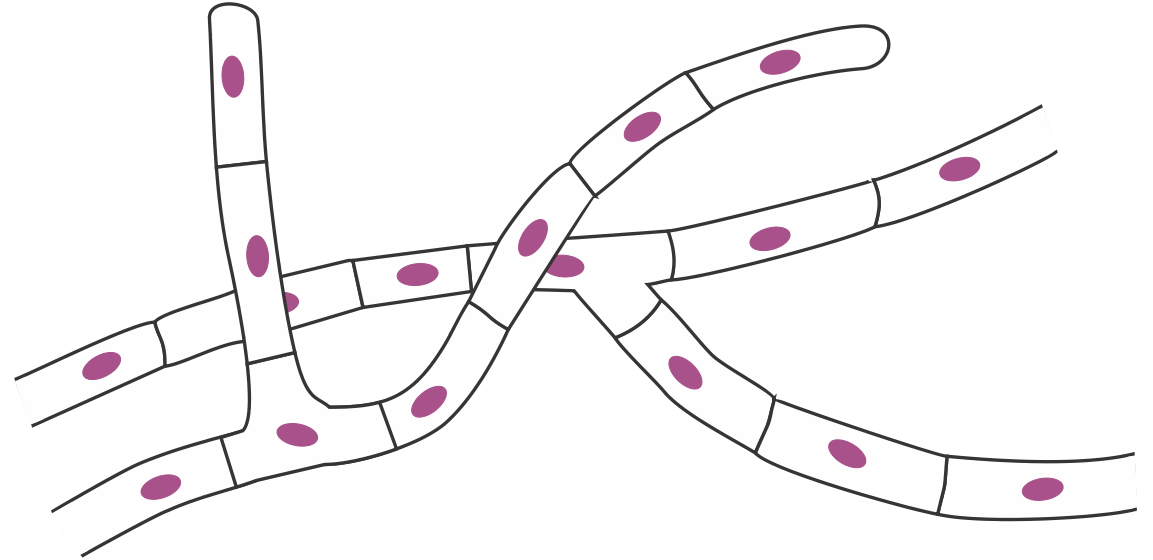
- A. Septated
- B. Non septated



10. Study the diagram and answer:

This fungus reproduce by:

- A. Budding
- B. Binary Fission
- C. Spore Formation



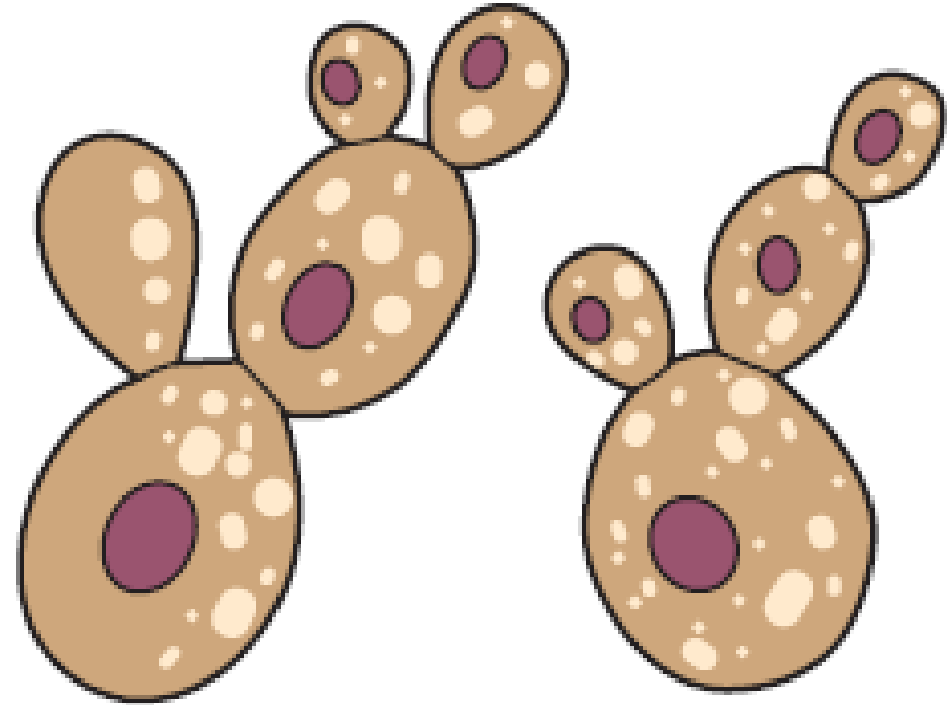
11. Study the diagram and answer:

The type of this Fungus is:

- A. Mold
- B. Yeast

This fungus reproduce by:

- A. Budding
- B. Binary Fission
- C. Germination



12. Study the diagram and answer:

The type of this Fungus is:

- A. Mold
- B. Yeast

This fungus is:

- A. Septate
- B. Non septate

