Lecture 9

General Characters of Fungi

Objectives

- **Define** mycology, mycoses
- Explain **importance** of harmful and useful fungi and give examples
- Explain **structure** of fungal cell and compare it with bacterial cell
- Compare autotrophic and heterotrophic **nutrition**
- Explain the different modes of **nutrition** of fungi: (parasitic, symbiotic and saprophytic) and give examples.
- Classify fungi according to **morphology** (mold, yeast, dimorphic)
- Illustrate mold **morphology** (hyphae, septa)
- 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

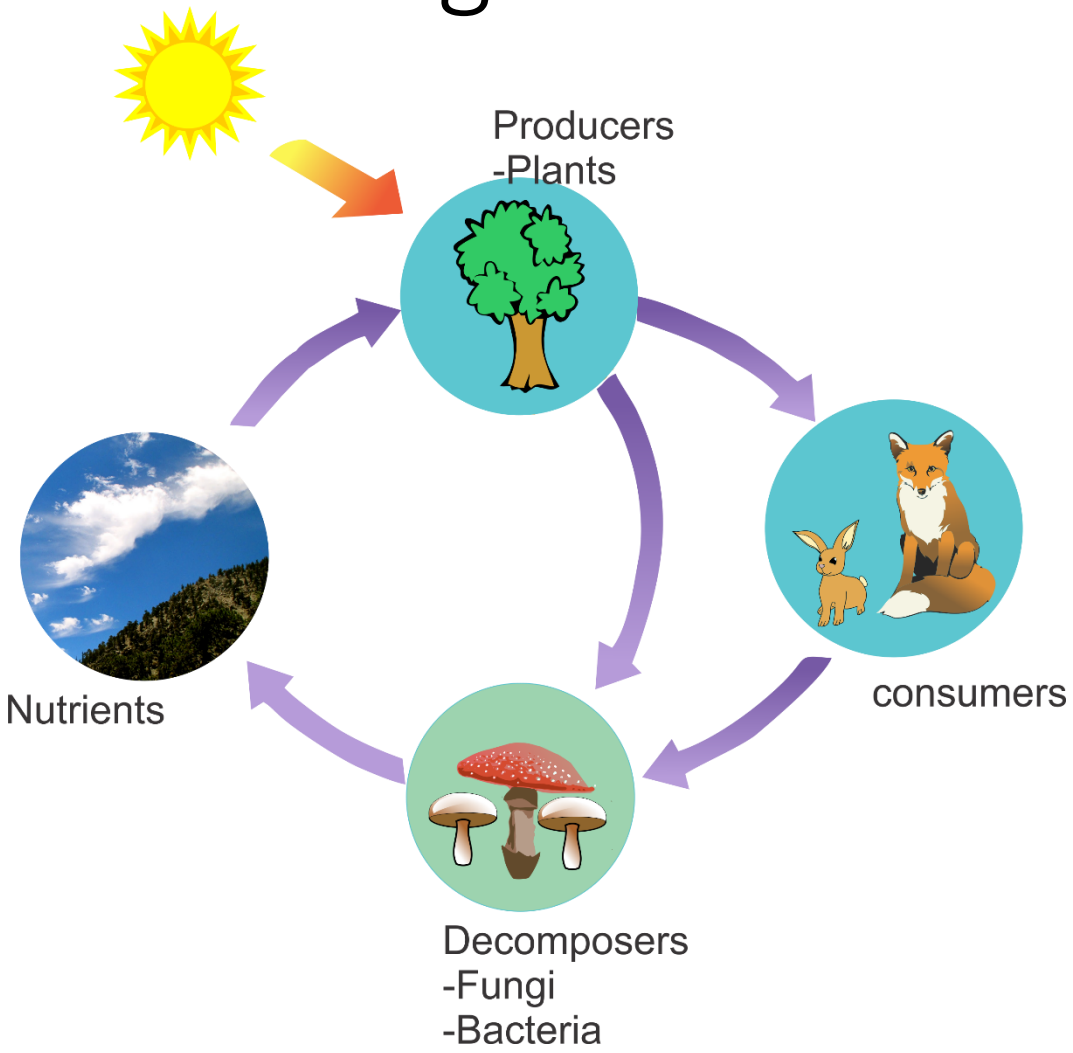
Some Fungi are harmful:

- 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**.

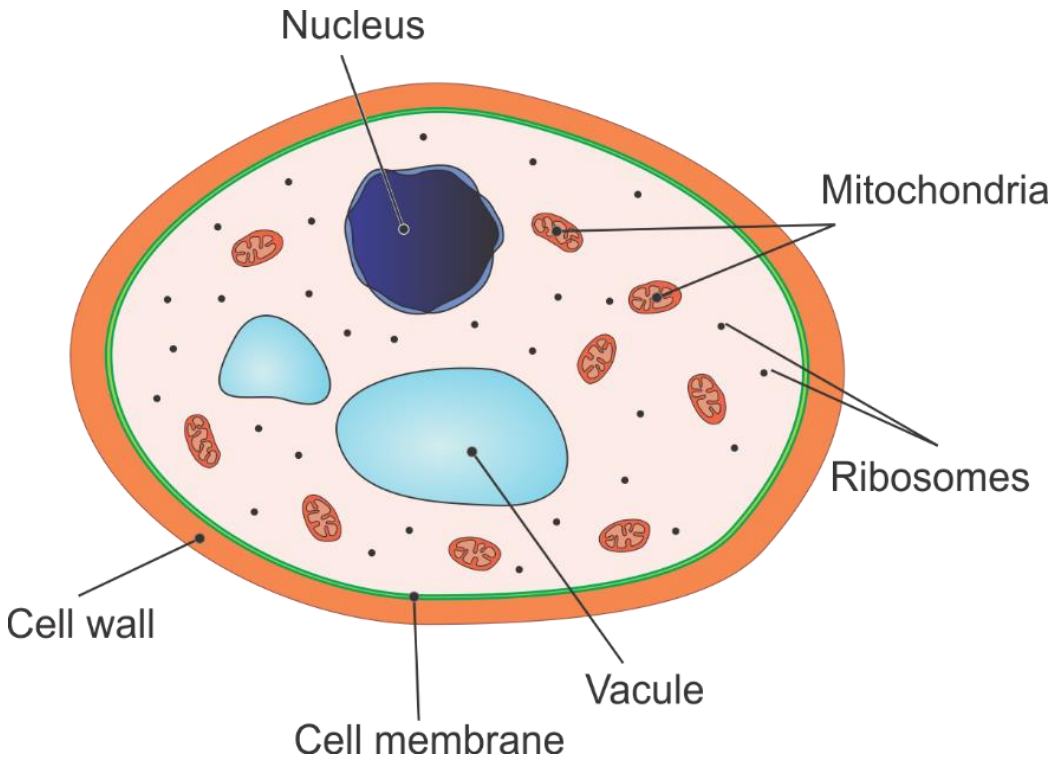
Importance of fungi – useful fungi

- Many antibiotics, including penicillin, are derived from fungi.

Structure

Fungi are Eukaryotic

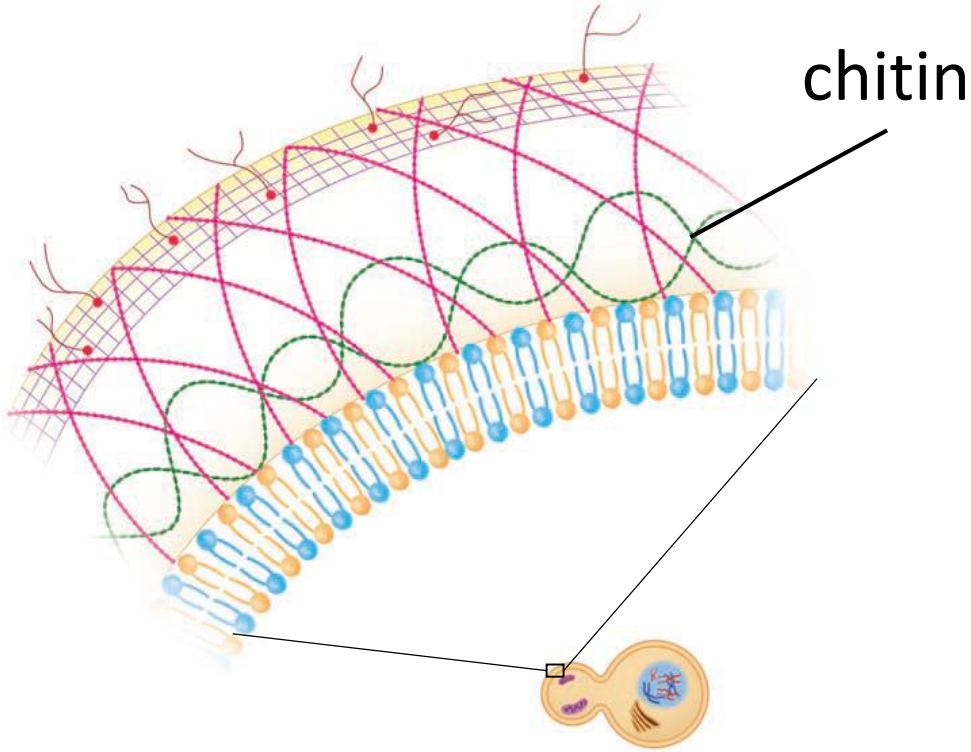
- Fungus cell contains a **true** membrane-bound nucleus.
- Fungi have **membrane-bound organelles** such as mitochondria, endoplasmic reticulum, and the Golgi apparatus.



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**.

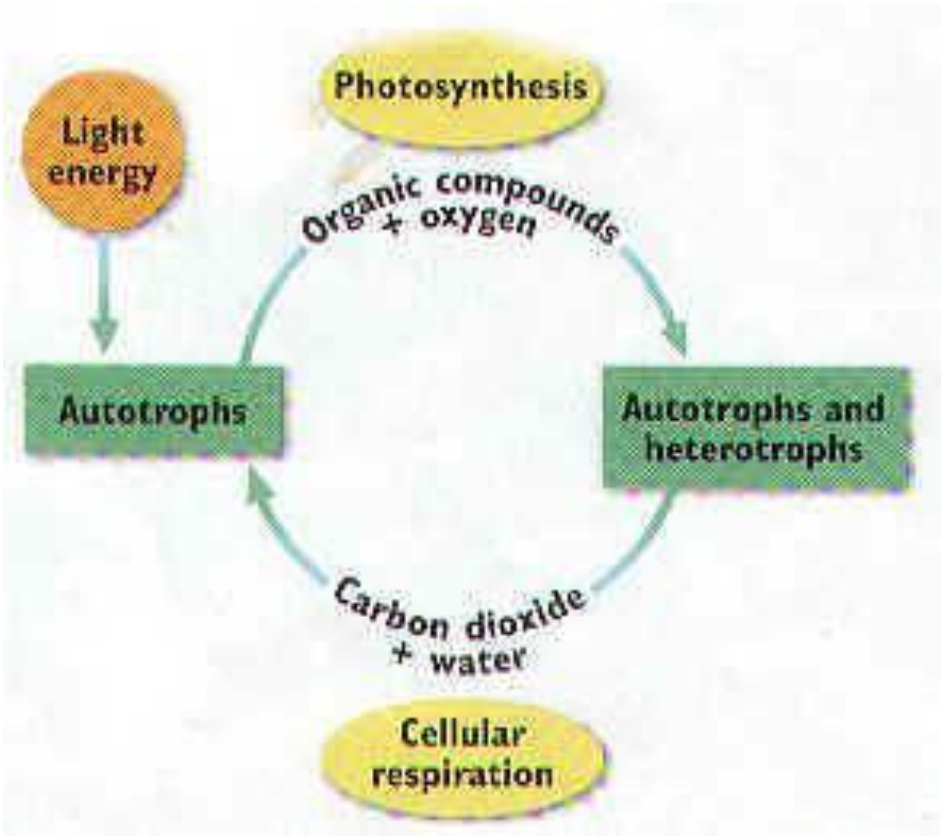


Fungi differ from bacteria

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

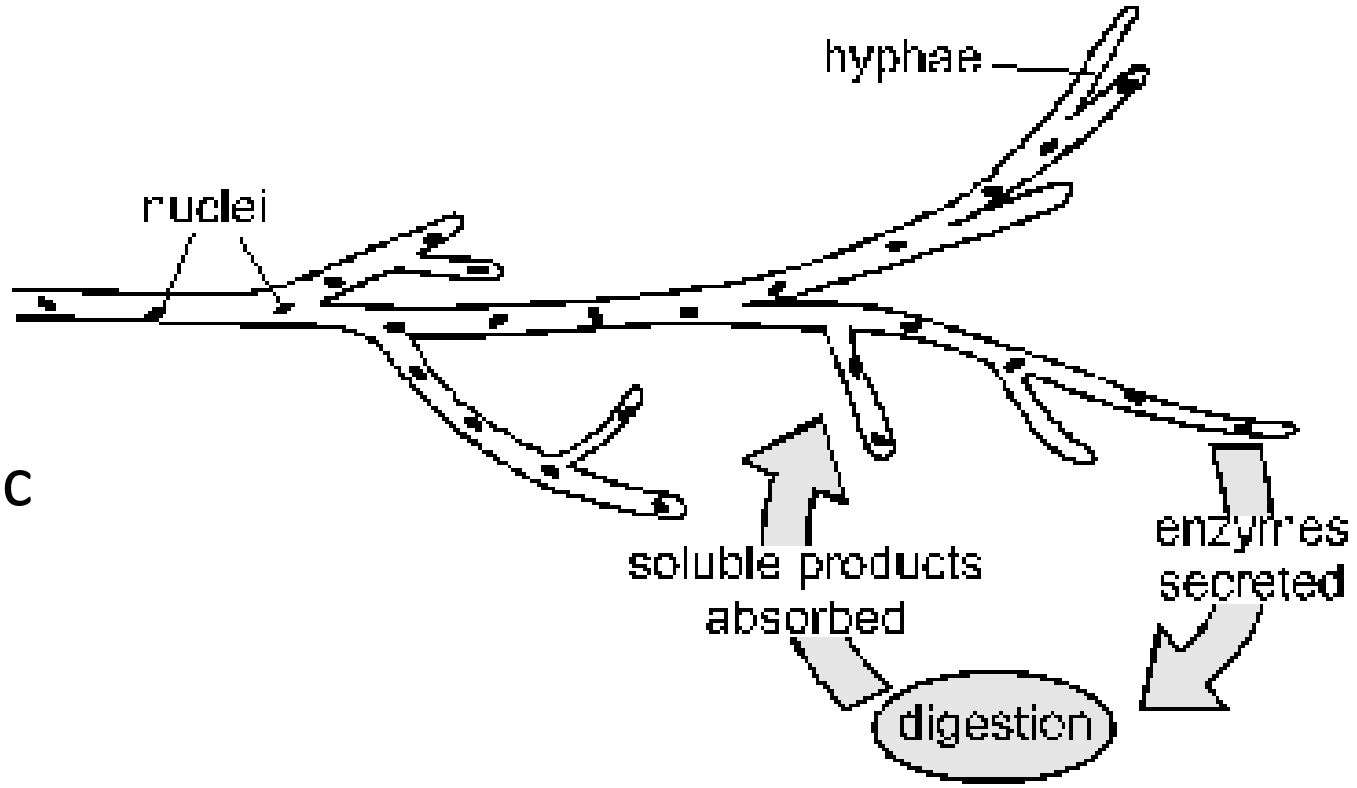
Heterotrophs

- 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



Nutrition: Absorption

- 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.

Fungal Morphology

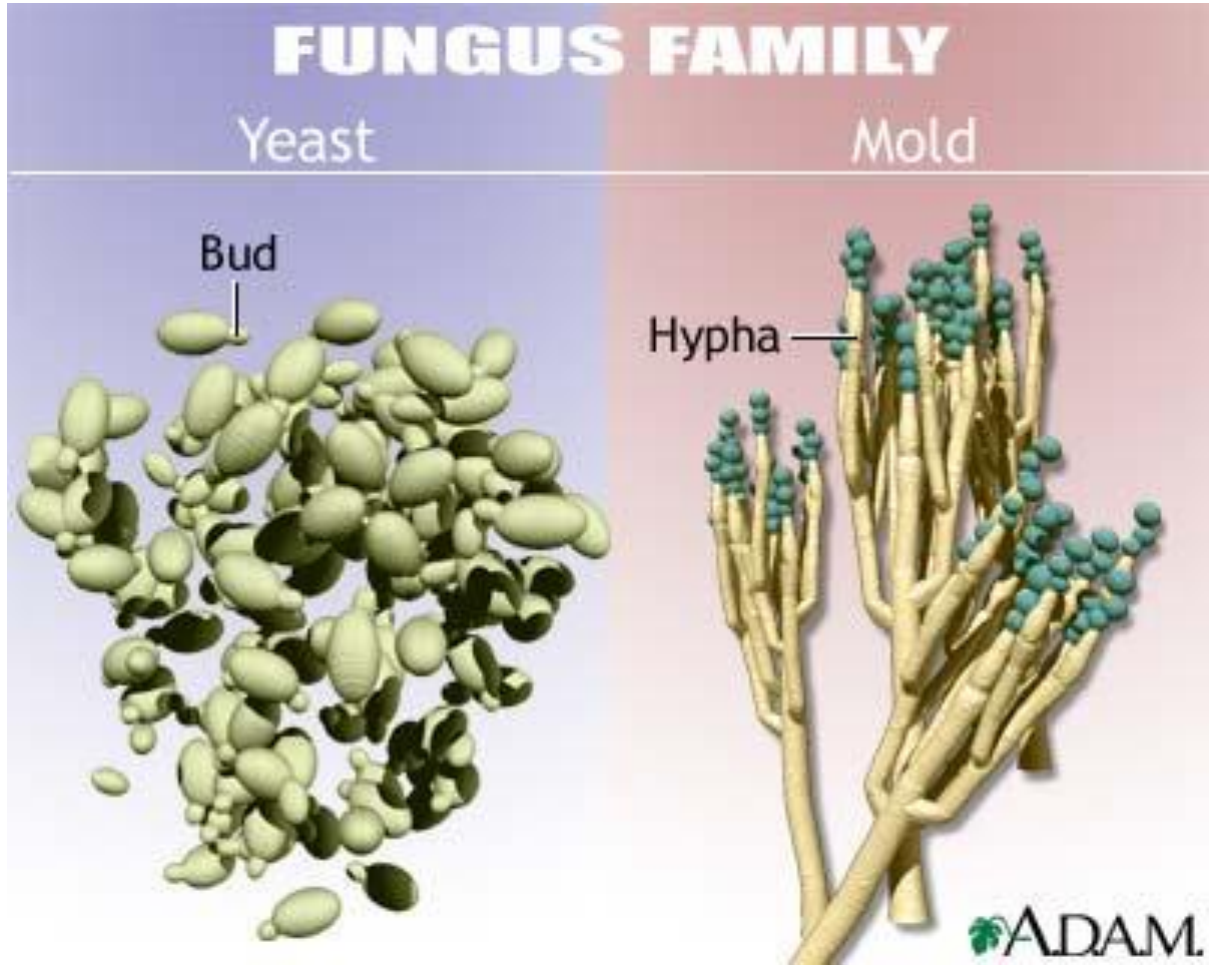
Fungi grow in two basic morphological forms:

❶ Molds

❷ Yeasts (Budding fungi).

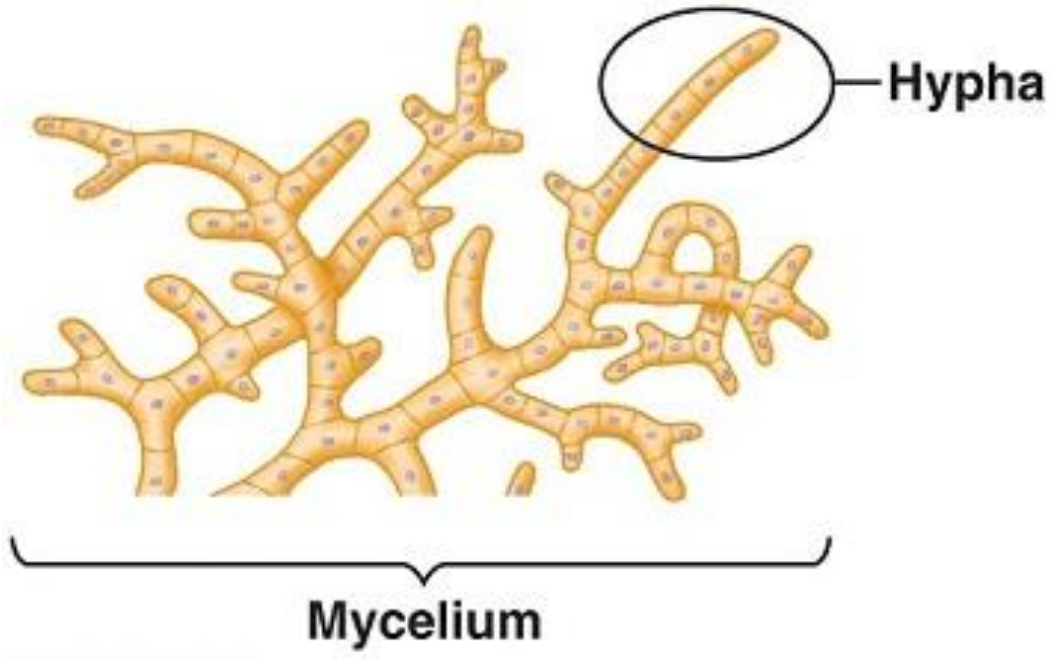
In addition some fungi are

❸ Dimorphic (can switch between yeast and mold forms)



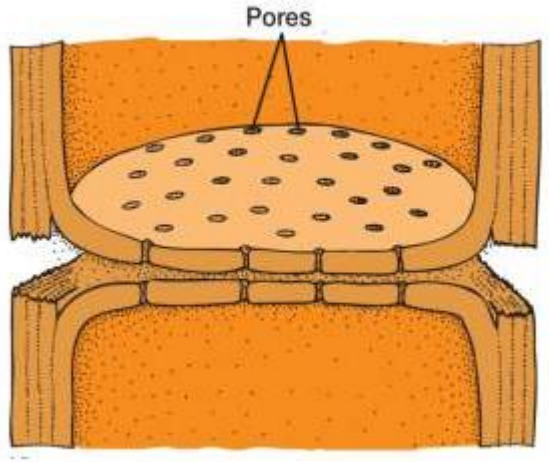
(1) Molds (filamentous fungi)

- 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.**

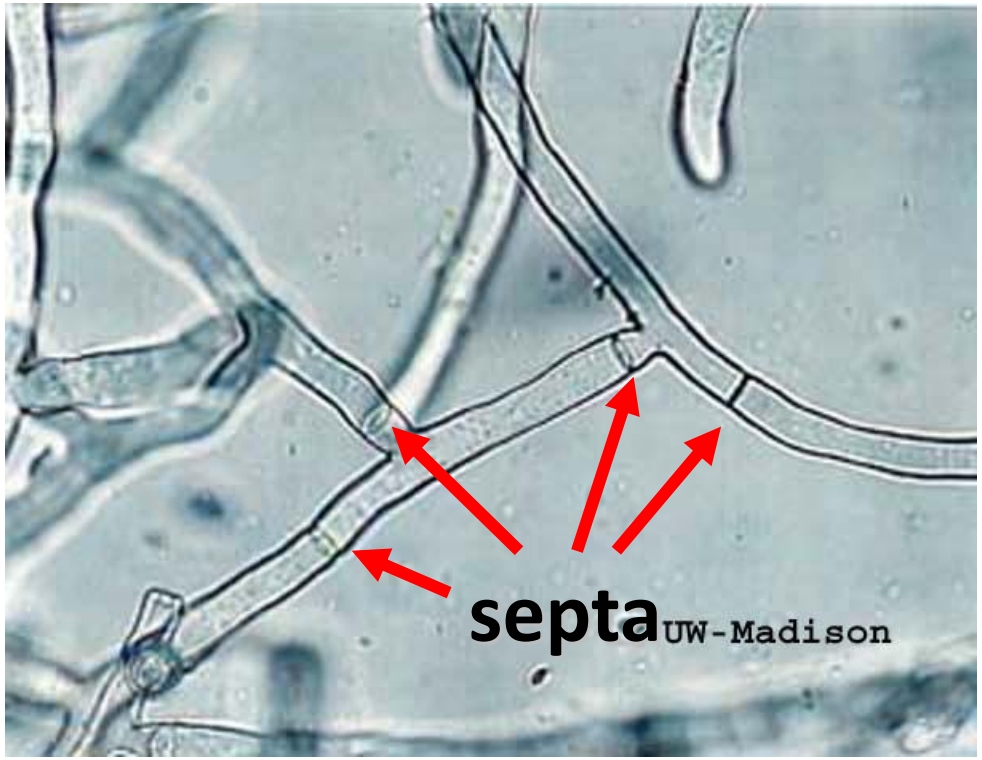


Hyphae and Septa

- Individual strands of mycelium are called hyphae (single: hypha).



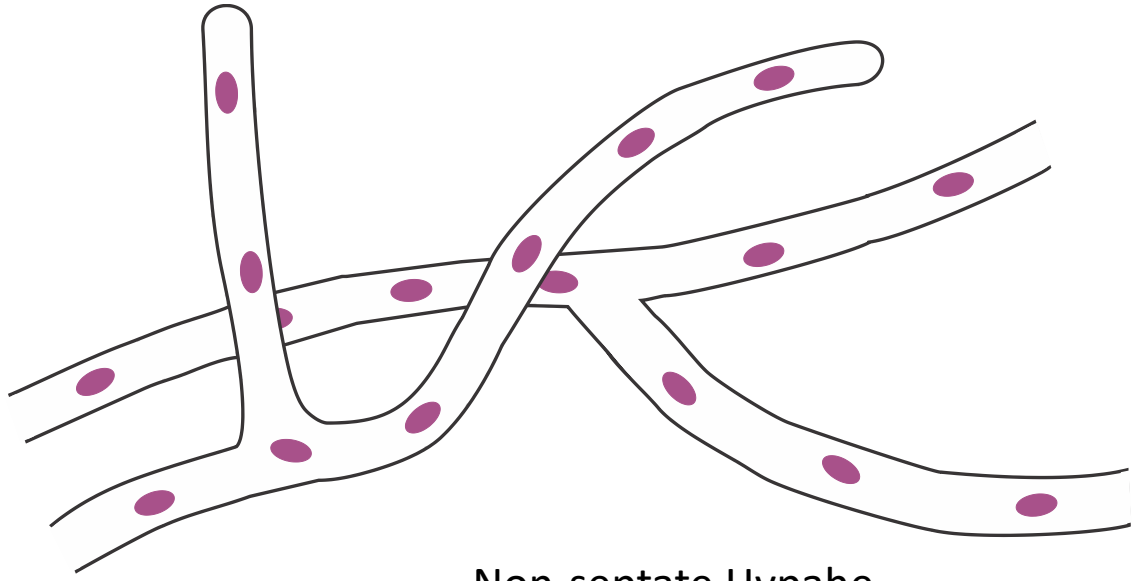
- In some fungi, hyphae are partitioned into cells by cross walls called **septa** (single: septum).



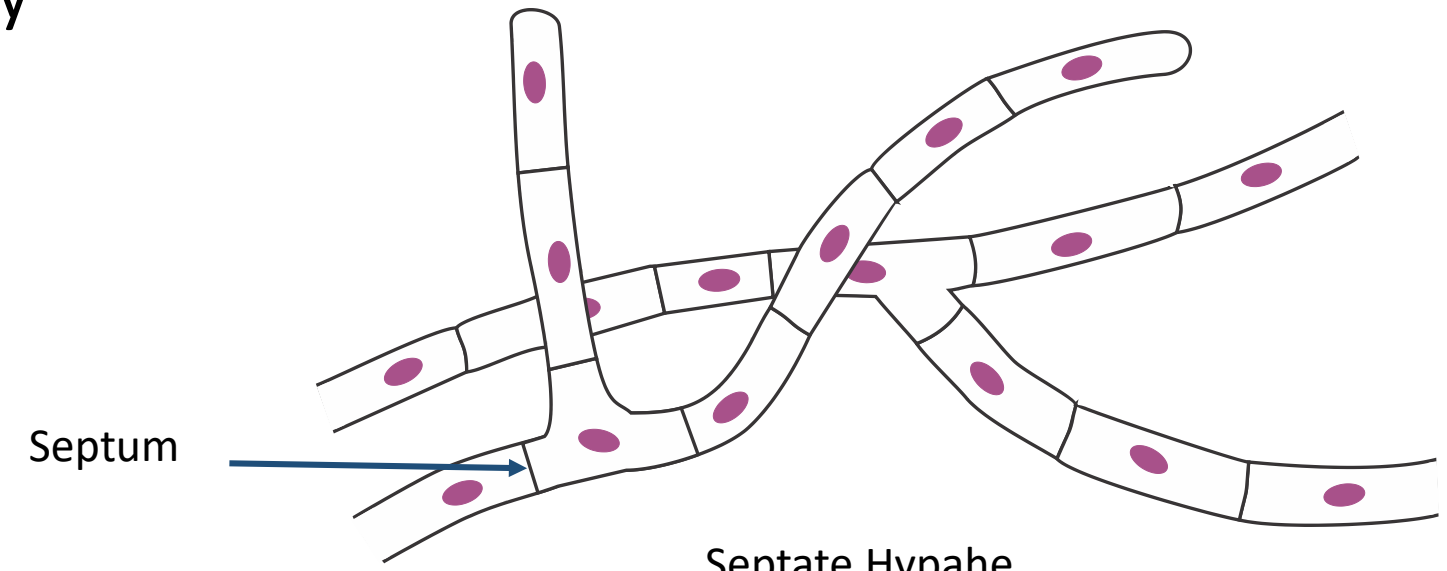
Septated / non septated

According to the presence of septa, hyphae are either:

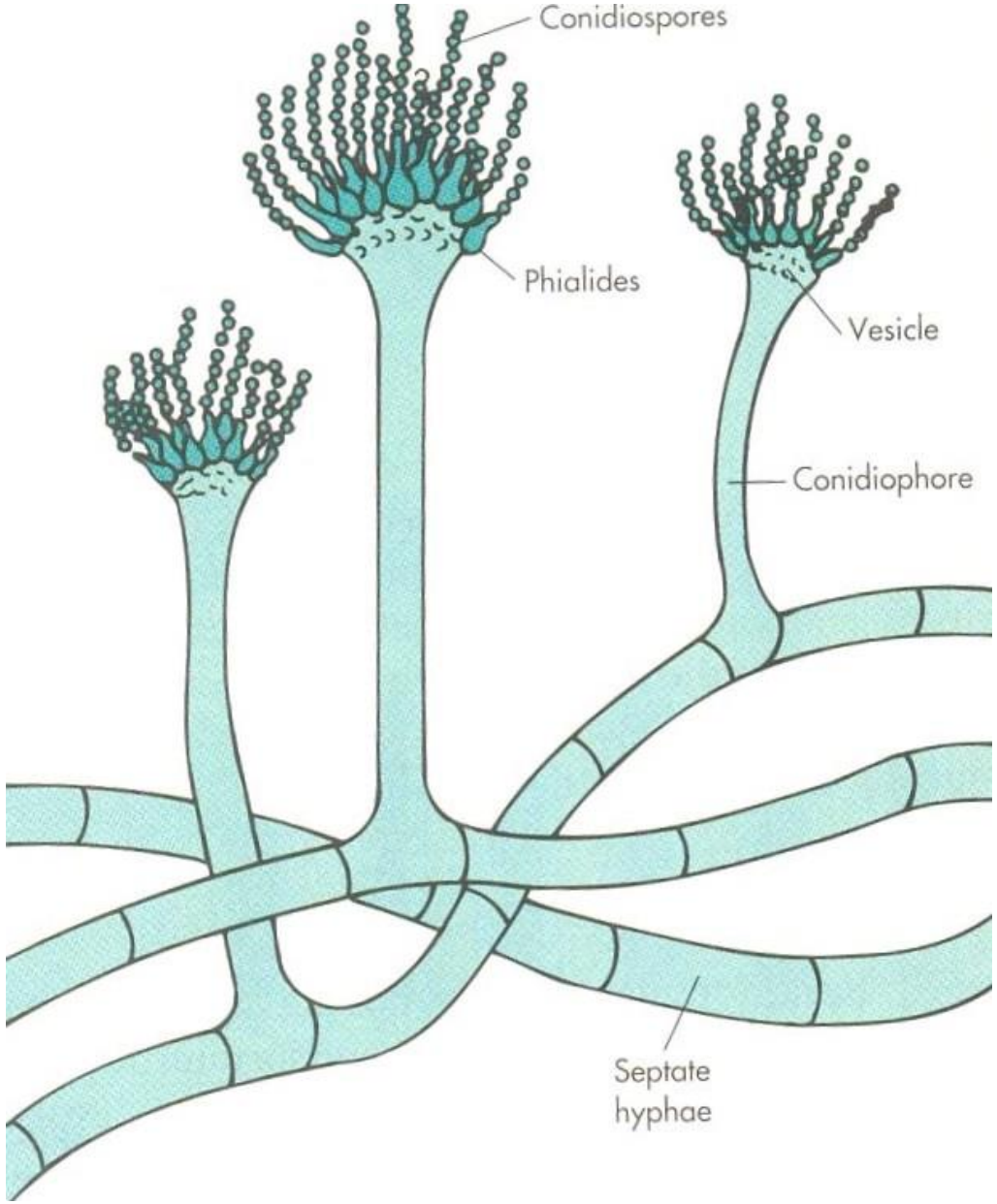
- **Septate** (divided into cells by septa) or
- **Non-septate** (not divided by septa).



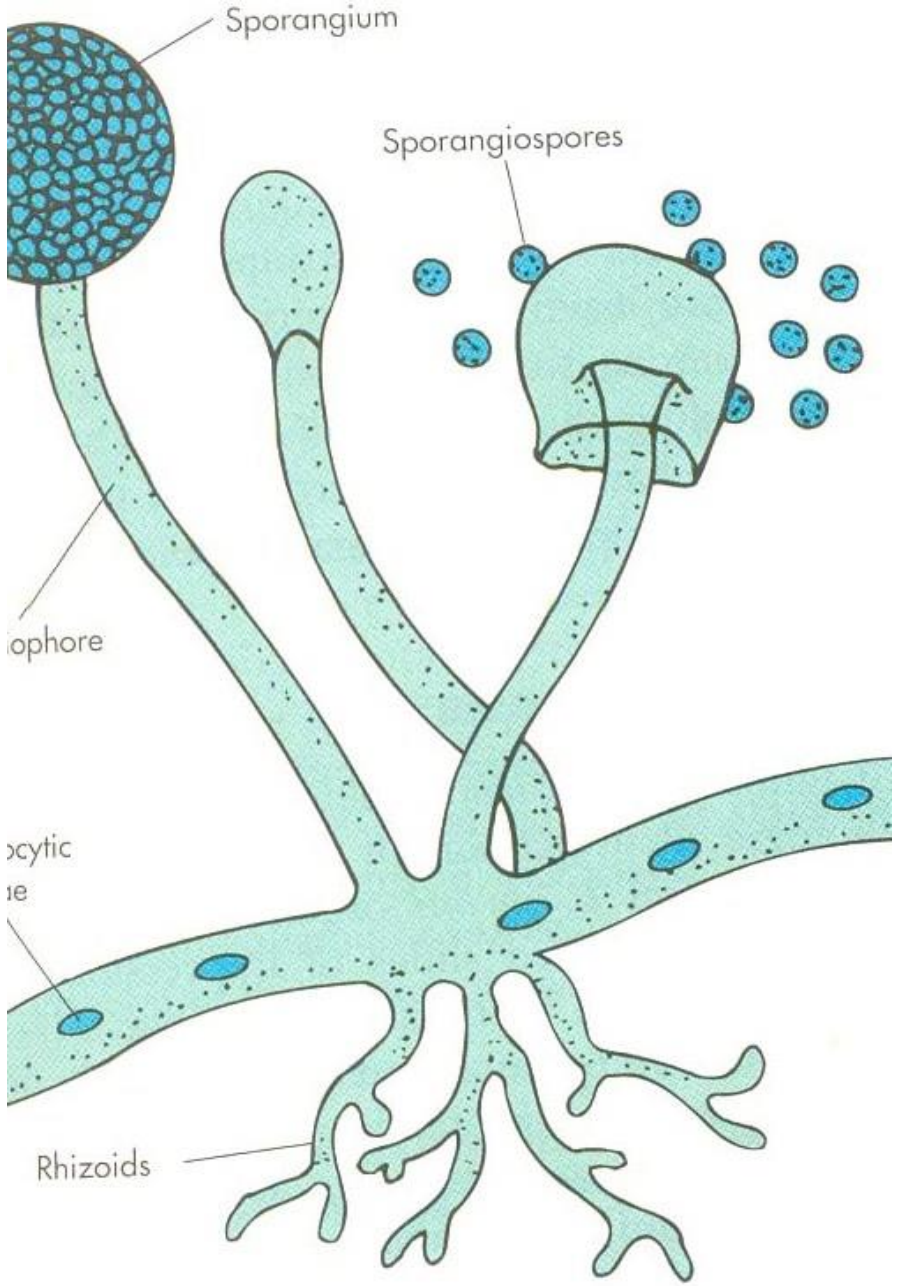
Non-septate Hypahe



Septate Hypahe



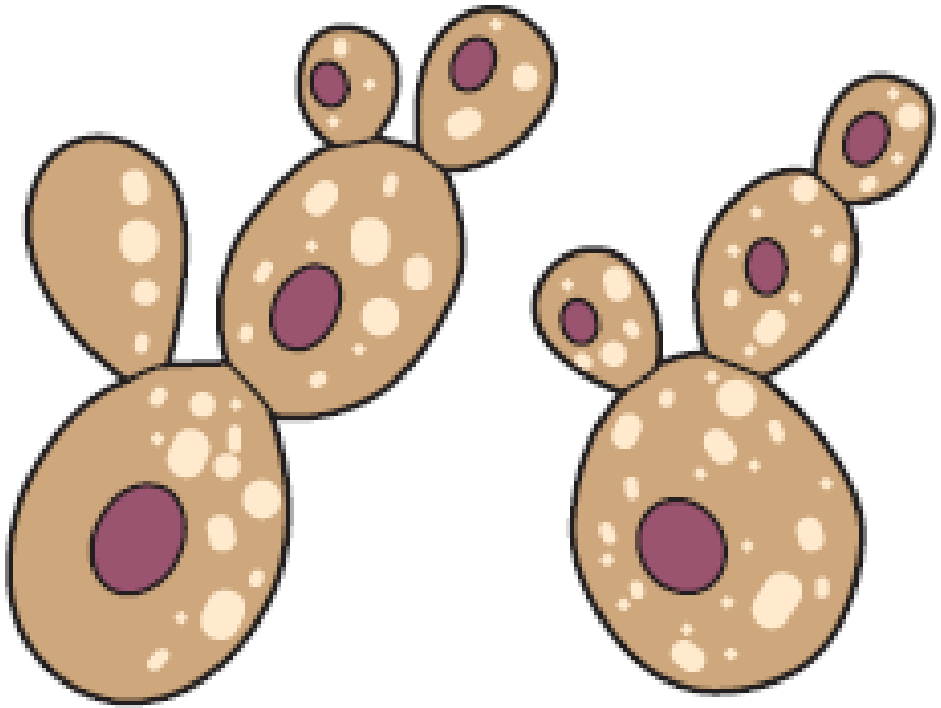
Septate hyphae



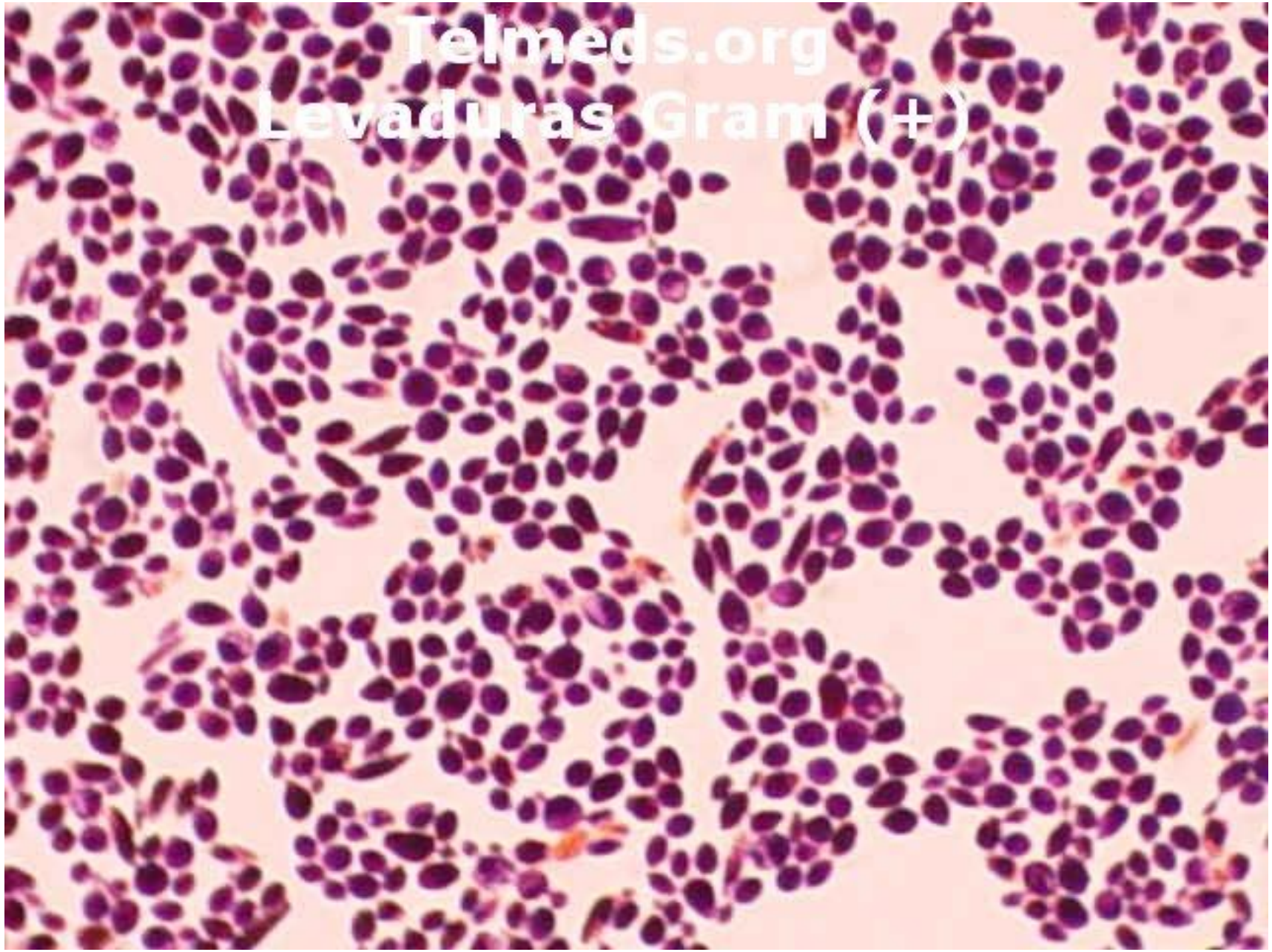
Non-Septate hyphae

(2) Yeast

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



Yeast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(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

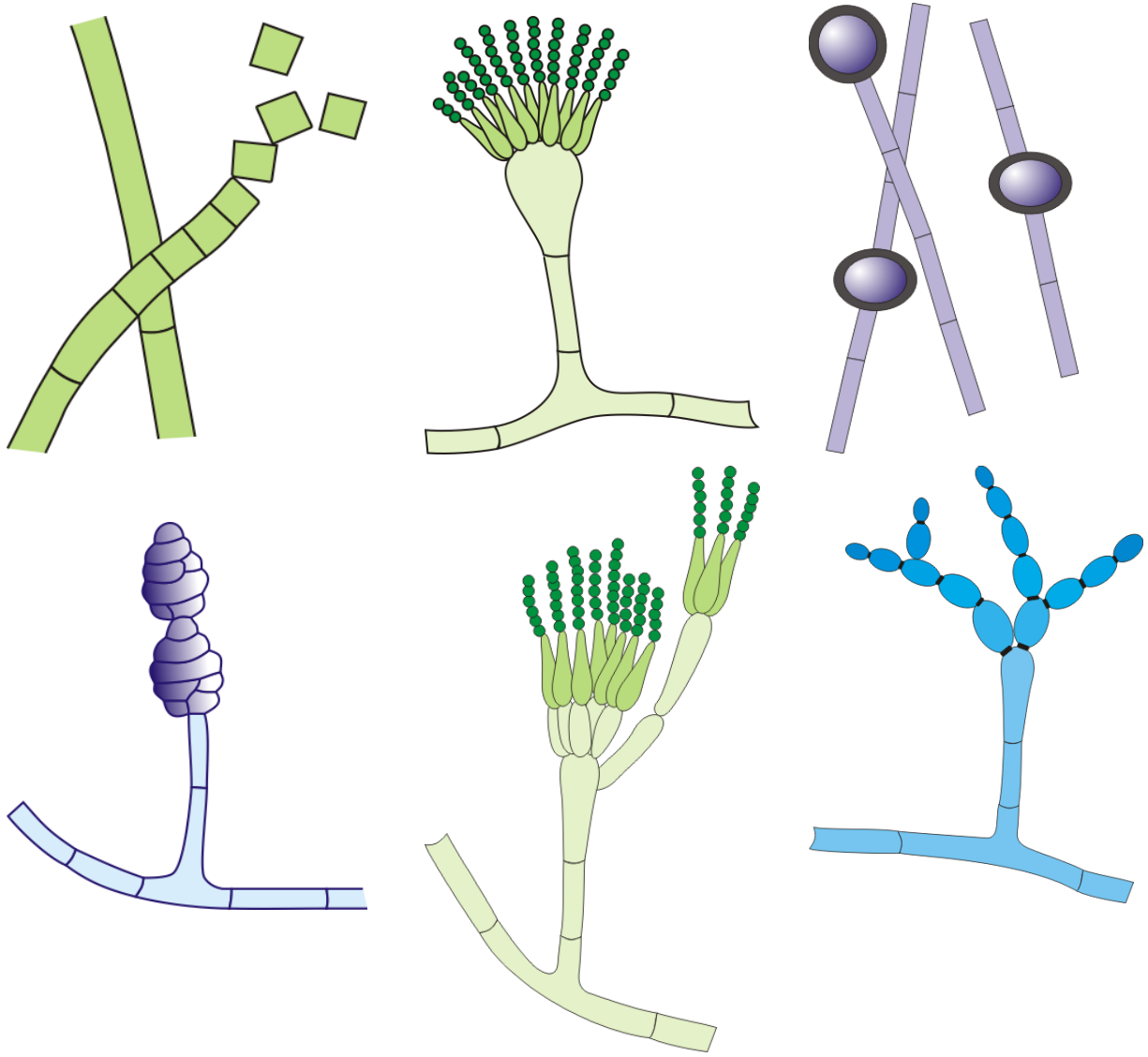
- Fungi reproduce asexually and/or sexually.

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.

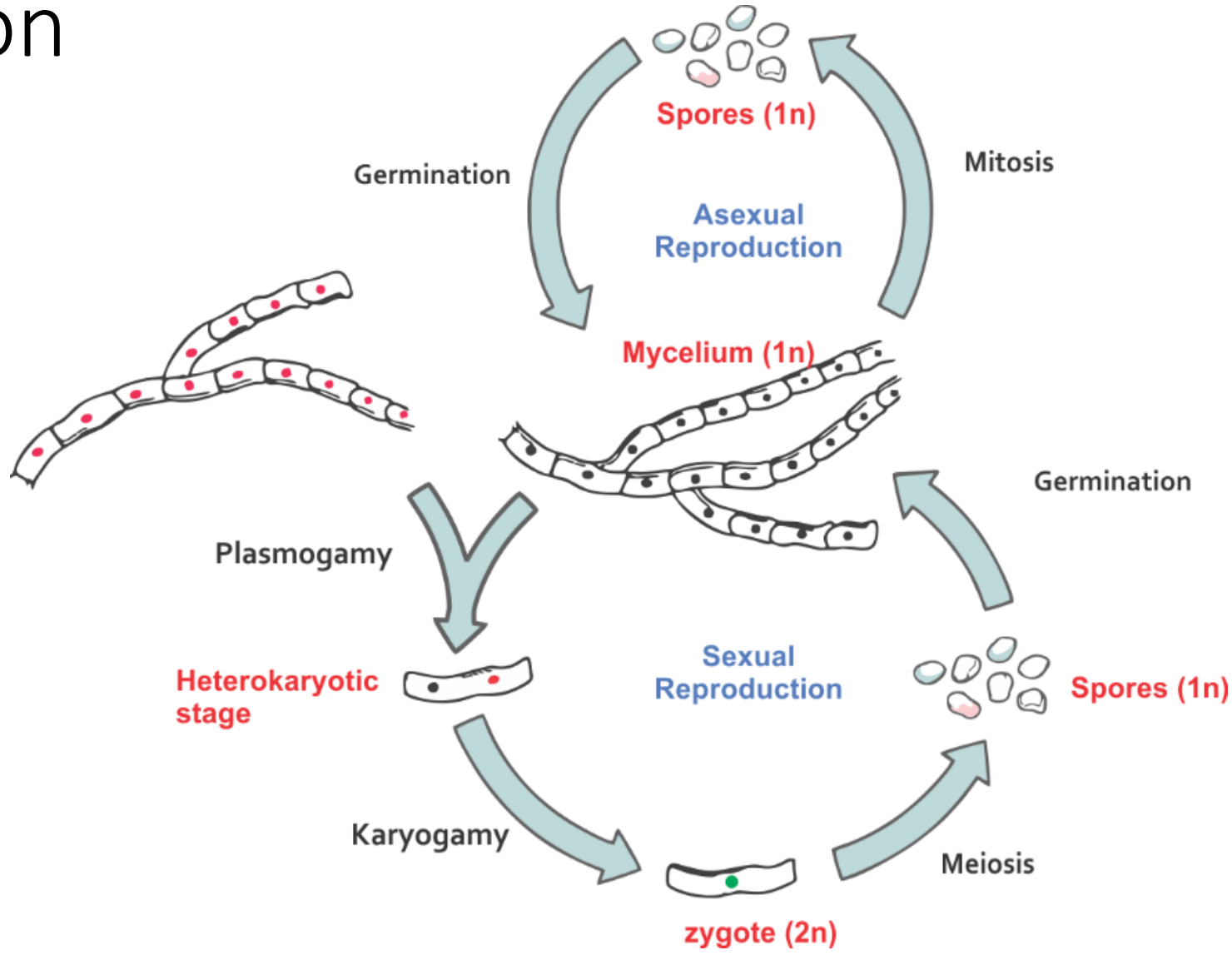
Fungal Spores

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



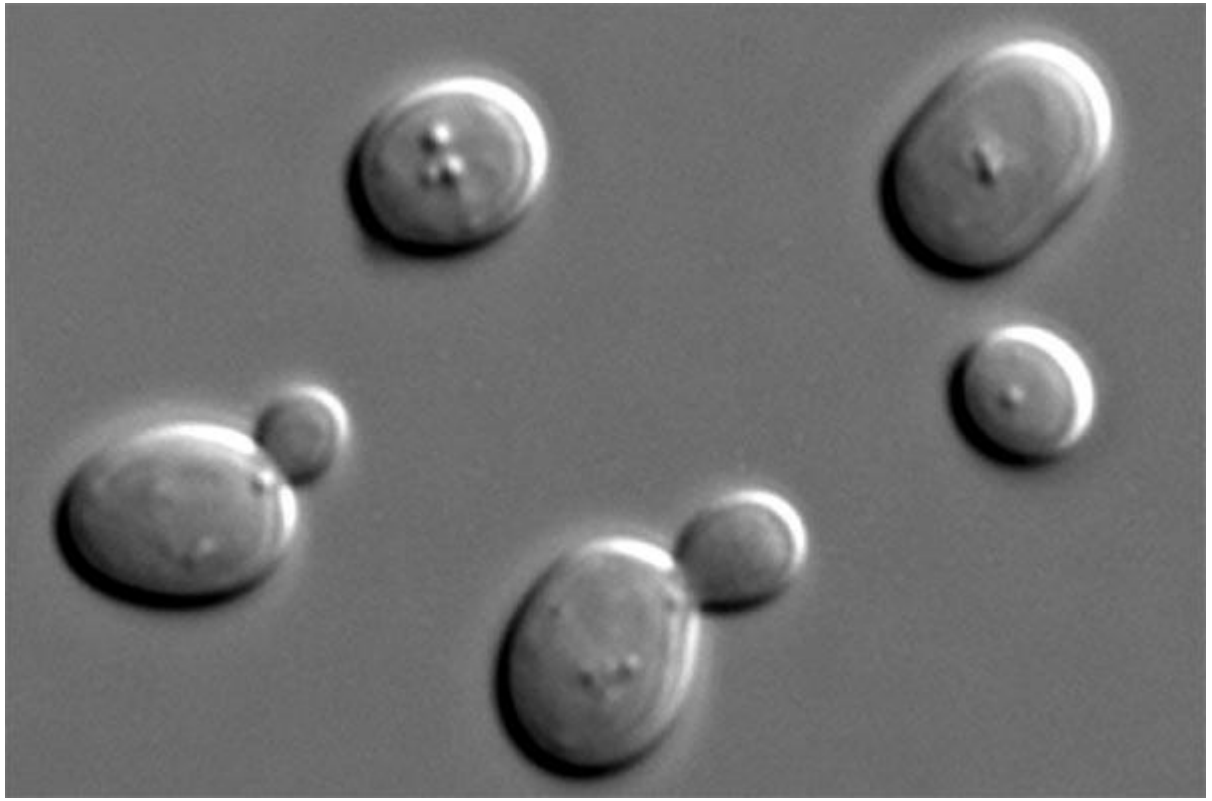
Mold Reproduction

- Molds reproduce by producing large numbers **spores**.
- Mold spores can be **asexual** (the products of mitosis) or **sexual** (the products of meiosis).



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:

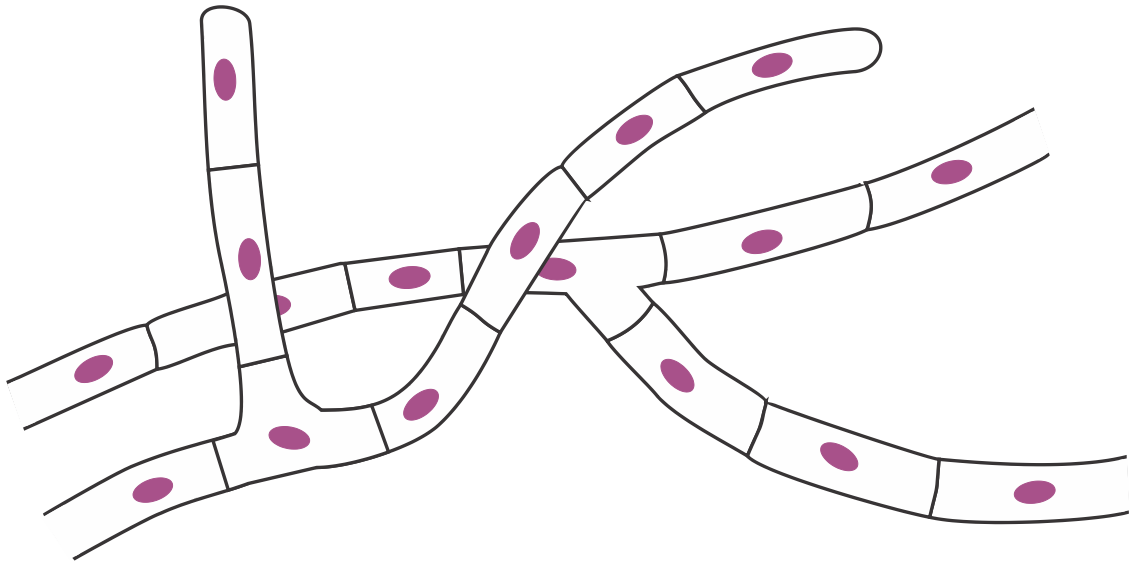
A. Mold

B. Yeast

This fungus is:

A. Septated

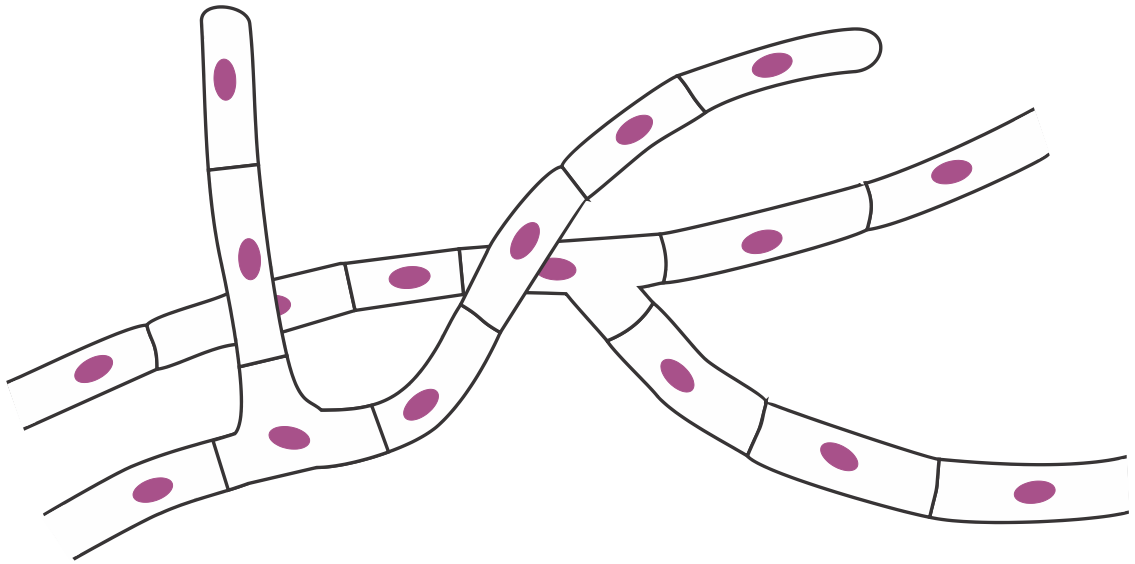
B. Non septated



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

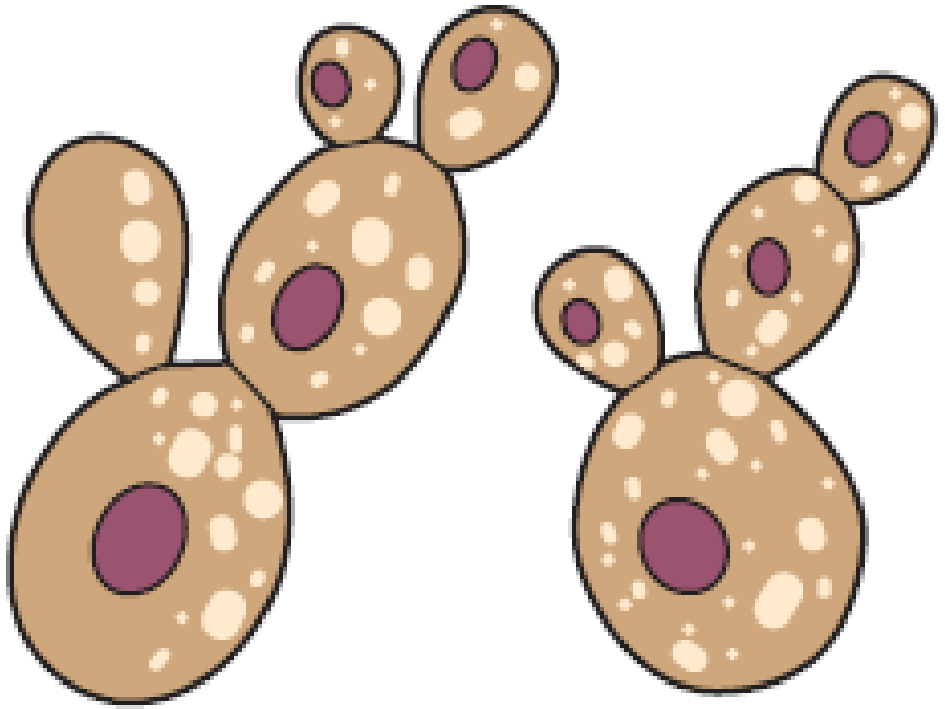
B. Yeast

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