



Lecture (5-6) Mycology

	Animal	Planta	Bacteria	fungi	
Nucleus	Eukaryotic	Eukaryotic	Prokaryotic	Eukaryotic	
wall	—	+			
Nutrition	Heterotroph				
Wall made of			peptidoglycan	chitin	
organelles	+				

Mycology




Fungi

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- 1. Definition**
 - 2. Properties**
 - 3. Structures**
 - 4. Shapes**
 - 5. Nutrition**
 - 6. Reproduction**
 - 7. Motility**
 - 8. Classification**
 - 9. Identification**
 - 10. Importance and impacts**



Mycology

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

- Eukaryotic cells
- Unicellular or multicellular
- Uses sexual and asexual reproduction
- Have cell walls but no chlorophyll
- Heterotroph



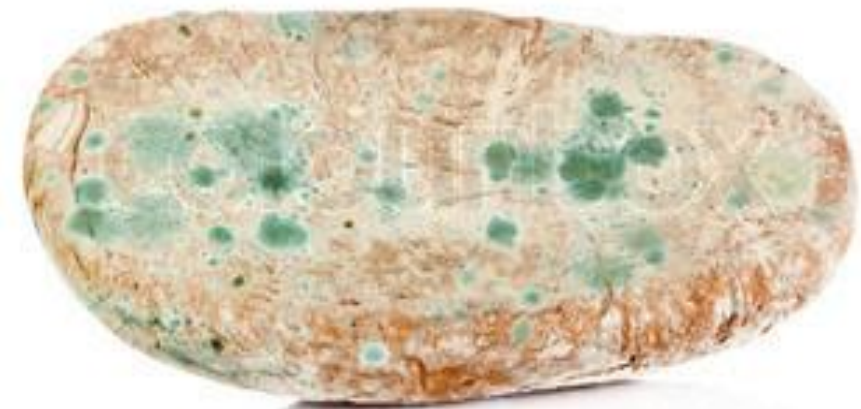
Fungi: are they more like plants or animals

Plants	Fungi	Animals
Plants use photosynthesis Autotroph	Cannot make their own food— Heterotroph	Cannot make their own food— Heterotroph
Have cell walls	Have cell walls	Do not have cell walls
Have chlorophyll	No chlorophyll	No chlorophyll
Create their own food.	Digest their food then ingest their food	Ingest their food then digest their food

Importance of fungi – harmful fungi

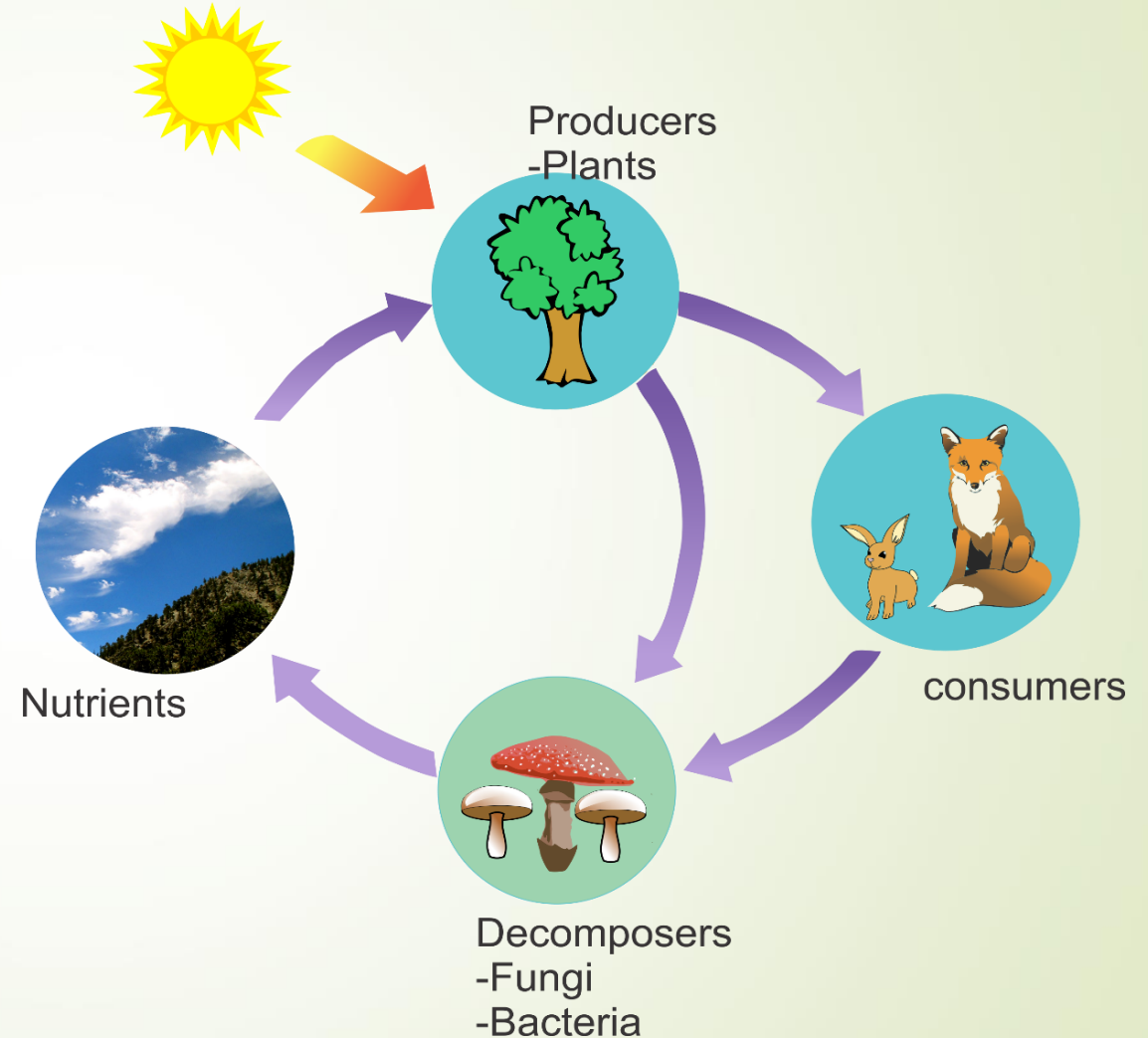
Some Fungi are harmful:

- Some fungi can cause **diseases** in **humans** and **animals**, either directly or by their toxins.
- Fungi can cause **plant diseases** and **destroy** harvest.
- Molds cause **foodstuff to spoil**.



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 some kinds of **cheese**.



Importance of fungi – useful fungi

- Many **antibiotics**, including penicillin, originate from fungi.



Fungal Diseases (mycoses)

- Systemic mycoses
- Subcutaneous mycoses
- Cutaneous mycoses
- Superficial mycoses
- Opportunistic mycoses

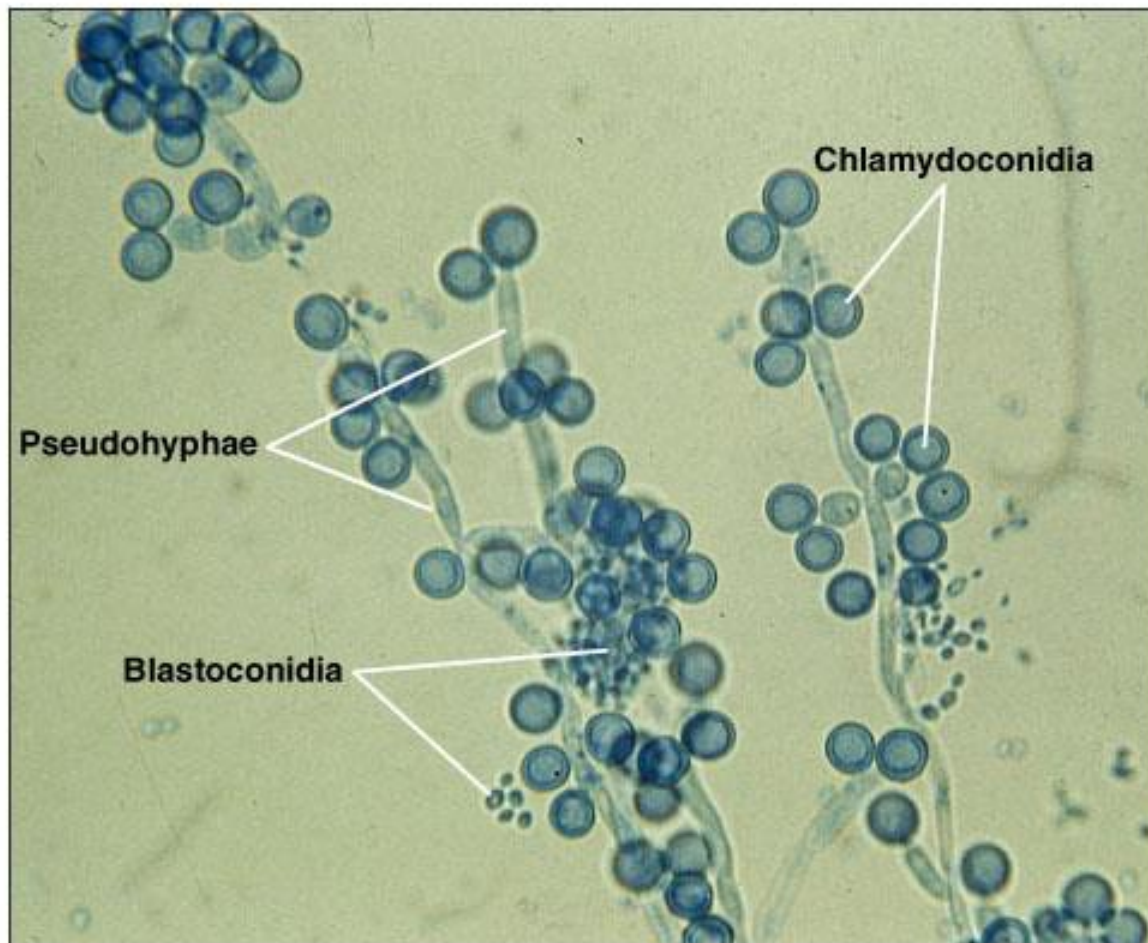
Deep within body

Beneath the skin

Affect hair, skin, nails

Localized, e.g., hair shafts

microbiota or fungi that are normally



(a) *Candida albicans*



(b) Oral candidiasis, or thrush



(a) Ringworm

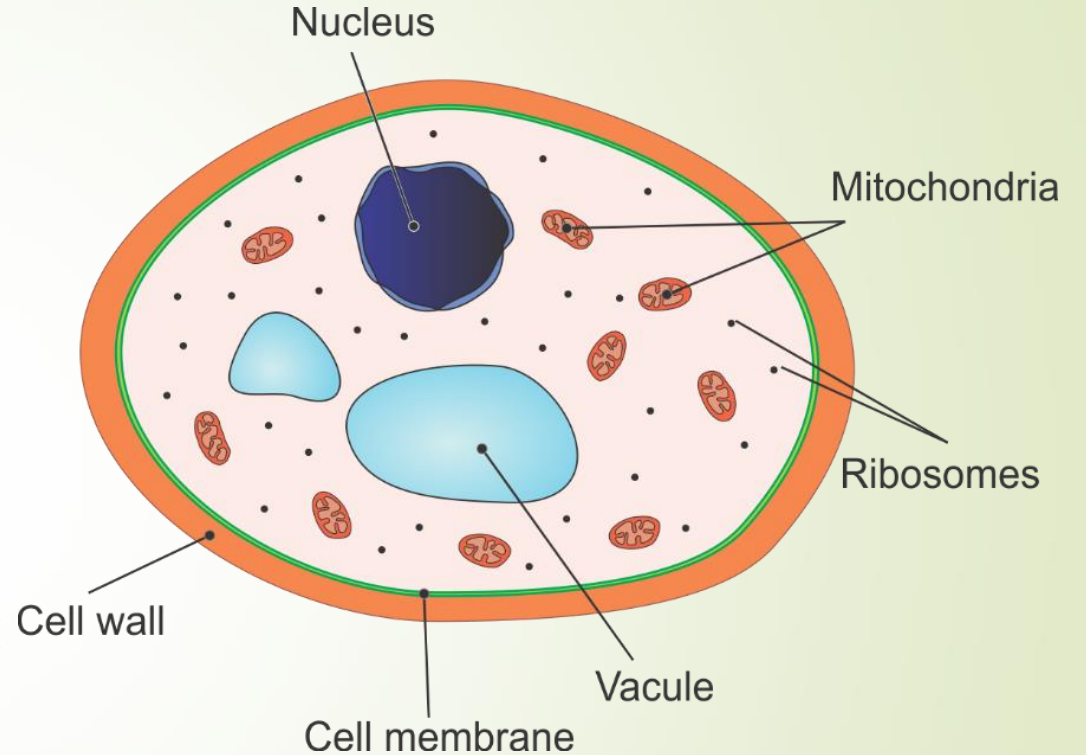
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(b) Athlete's foot

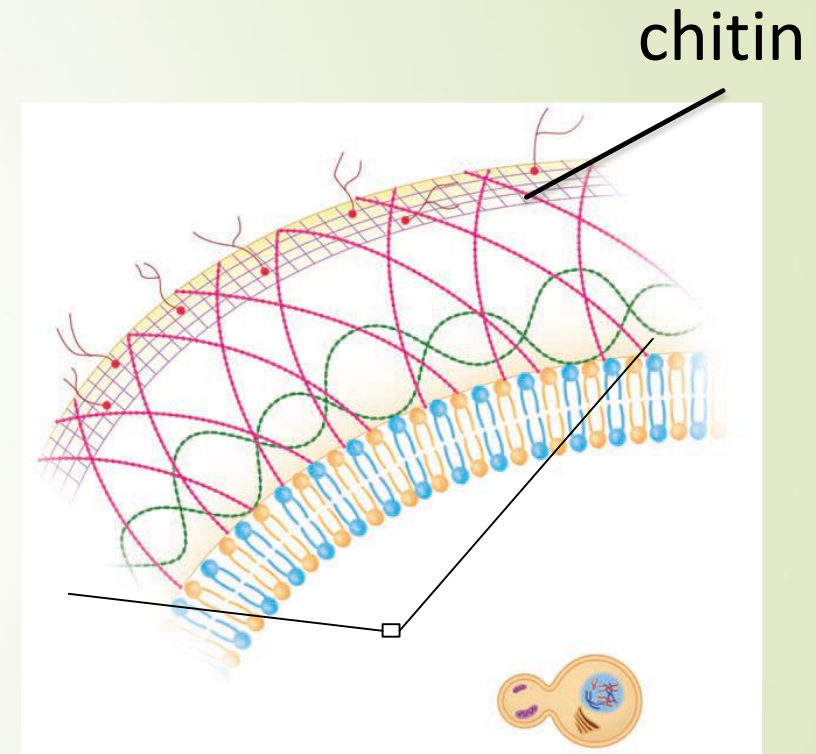
Fungi are Eukaryotic

- 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)
 - a fibrous substance consisting of polysaccharides and forming the major constituent in the exoskeleton of arthropods and the cell walls of fungi.
- Unlike bacteria, Fungal cell wall doesn't contain **peptidoglycan**.
- Unlike plants, Fungal cell wall doesn't contain **cellulose**.



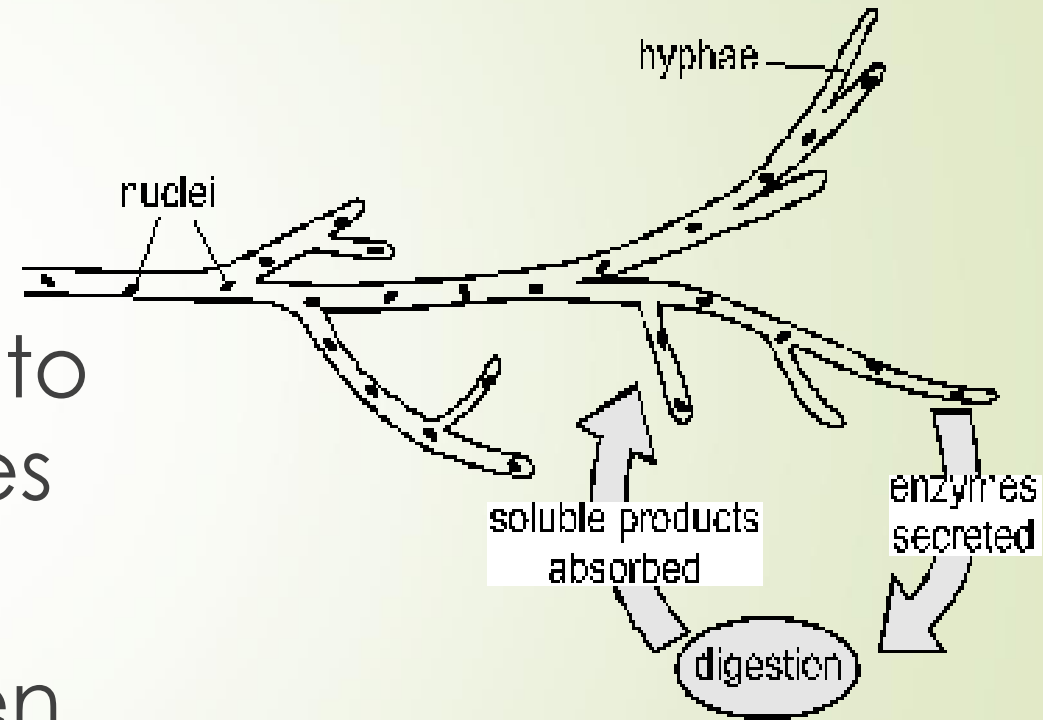


Fungi differ from bacteria

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

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.



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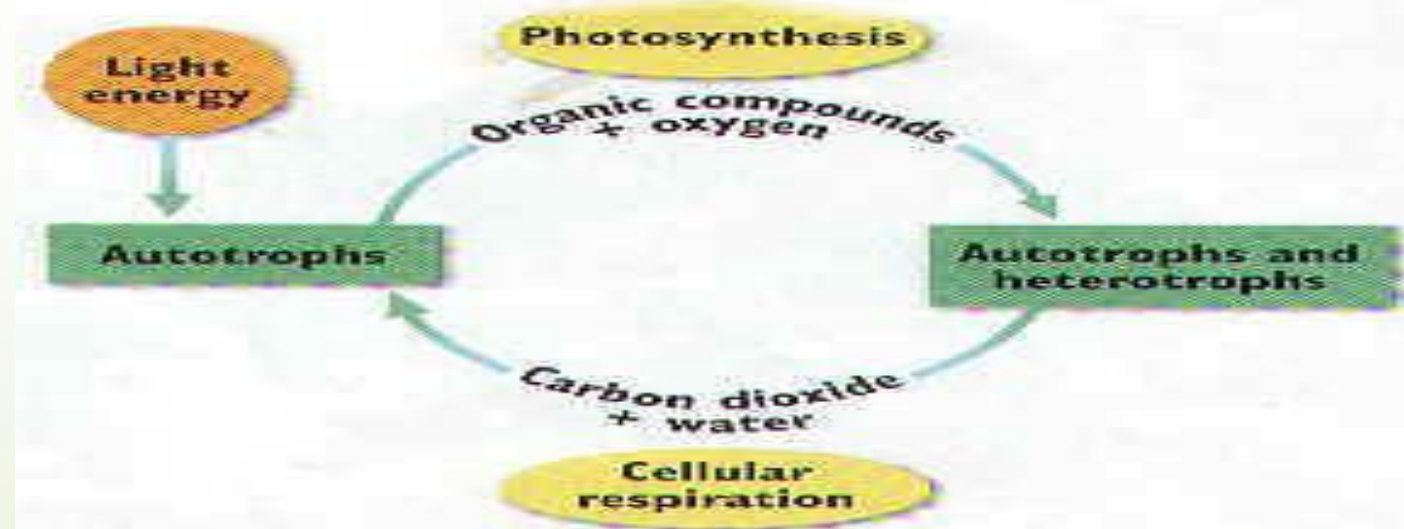
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Heterotrophs

- 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



Classification of fungi according to nutrition

Fungi can be:

1. Saprophotic: 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

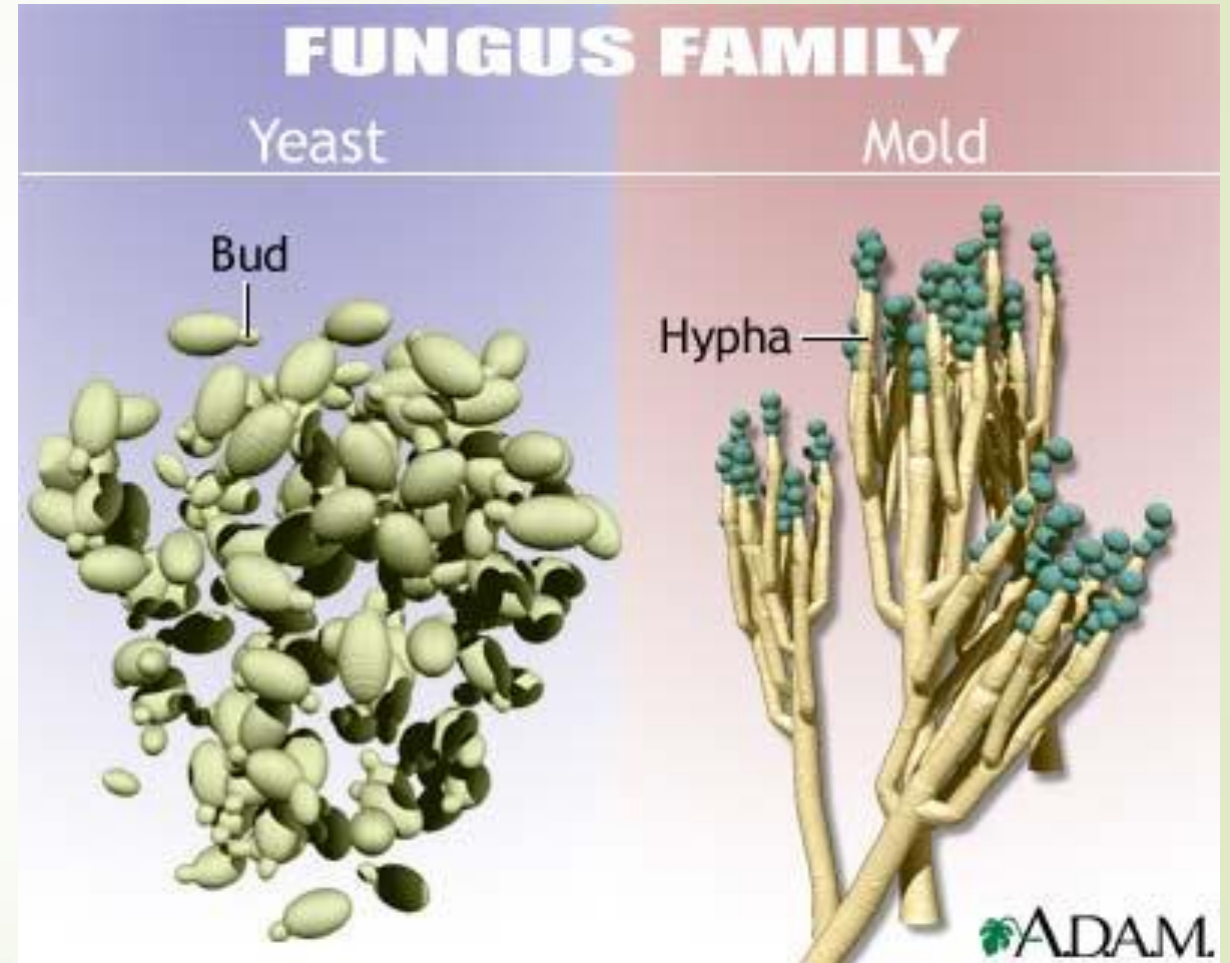
- ➡ Obtaining their nutrients from a **living** host while providing some **benefit** to that host
- ➡ **Mycorrhiza** is an example of symbiotic relationship. In this **fungal hyphae** are associated with roots of **plants**.



Fungal Morphology

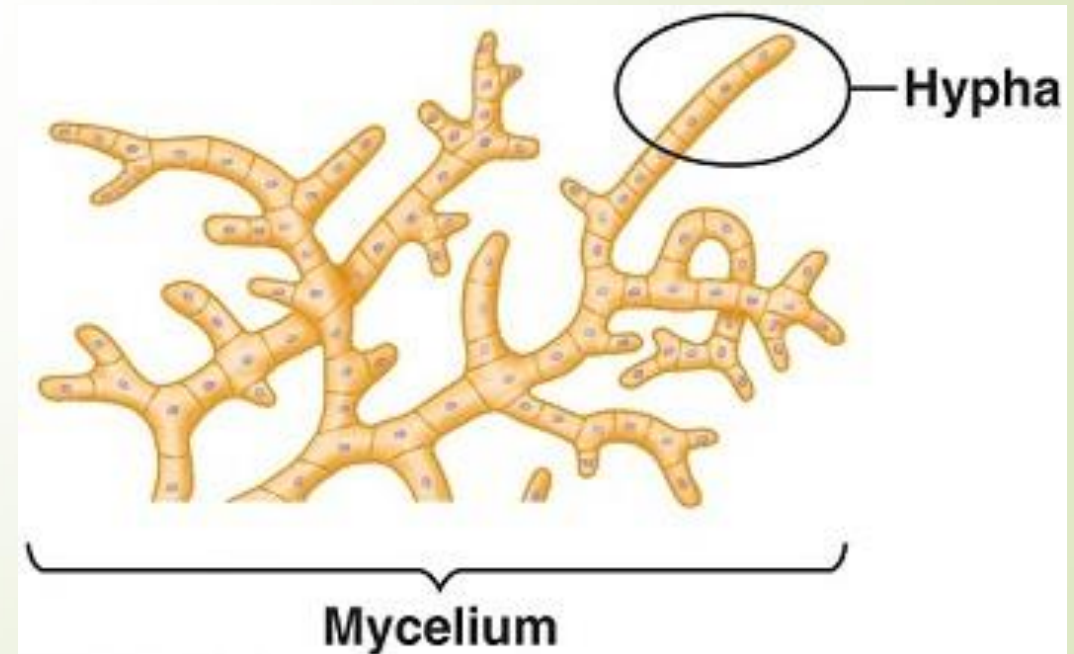
Fungi grow in two basic morphological forms:

- ▶ yeasts
- ▶ molds



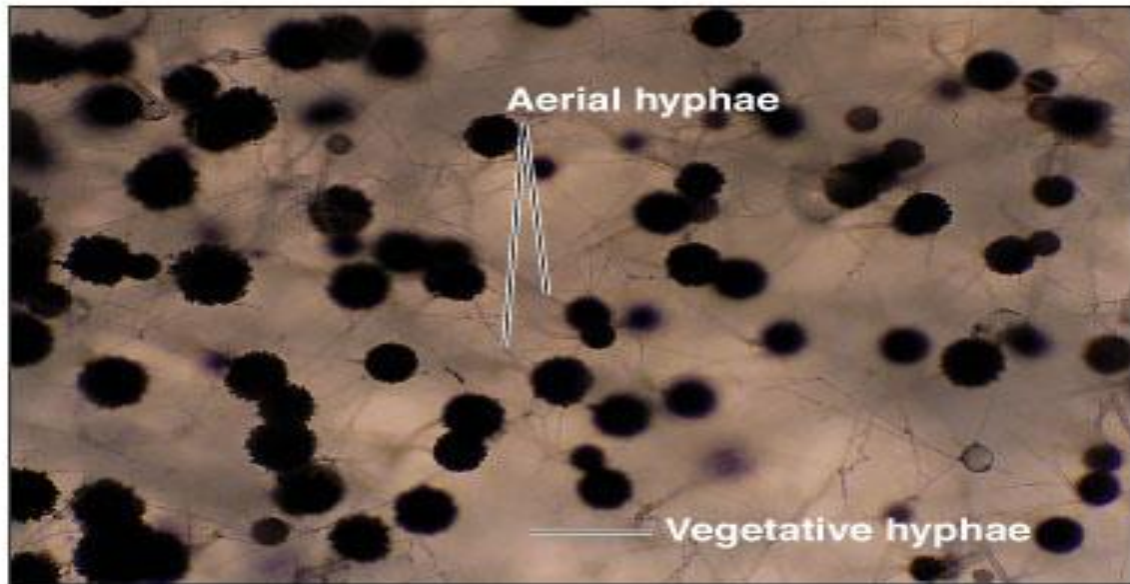
(1) Molds

- Growth in the mold form occurs by production of **Hyphae**.
- Hyphae are tubular branching filaments (2–10 μm in width) of fungal cells.
- The mass of intertwined hyphae that accumulates during active growth is a **mycelium**.

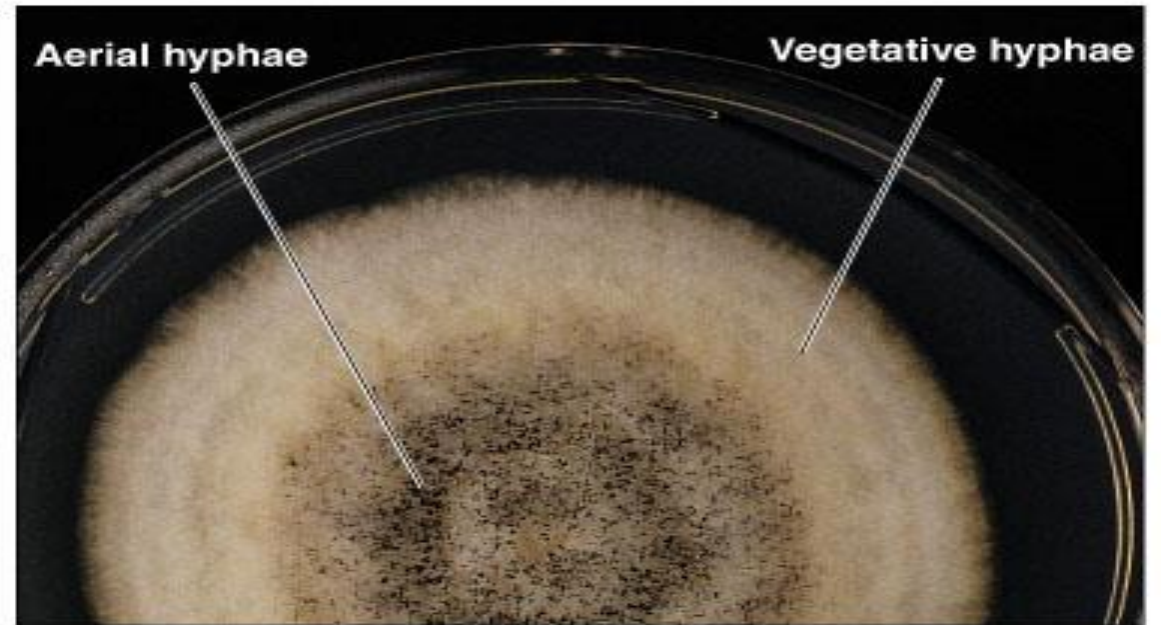


Molds

- ▶ The fungal thallus consists of hyphae; a mass of hyphae is a mycelium.



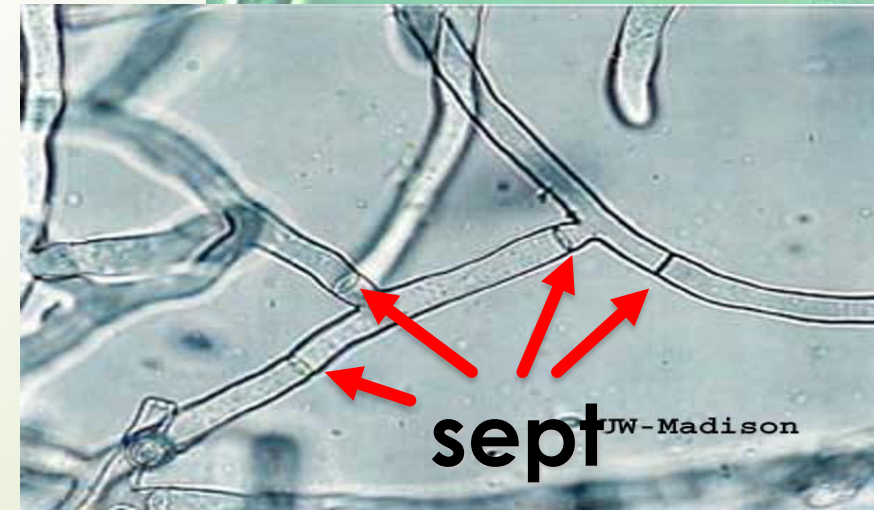
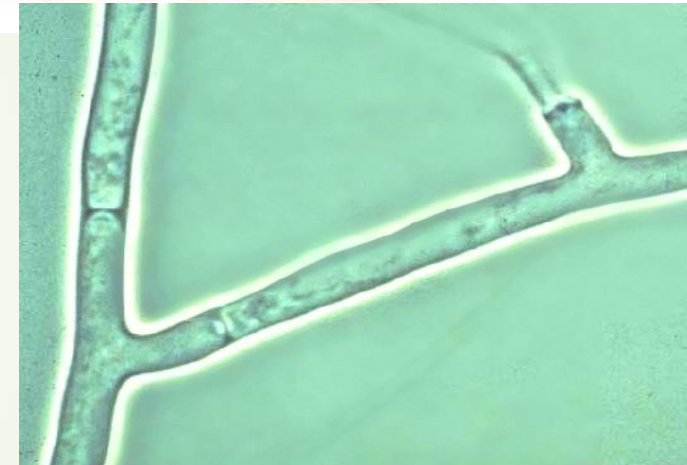
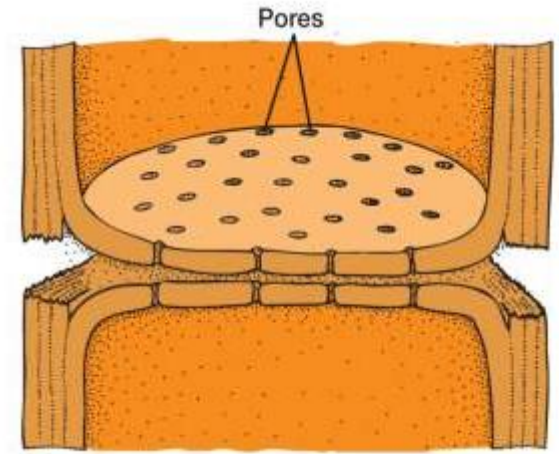
(a) *Aspergillus niger*



(b) *A. niger* on agar

Hyphae and Septa

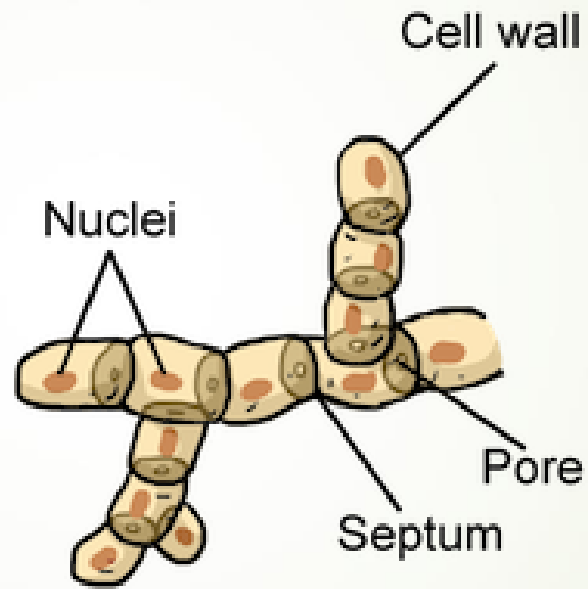
- Individual strands of mycelium are called hyphae (sing. = hypha).
- In some fungi, hyphae are partitioned into cells by cross walls called **septa** (single: septum).



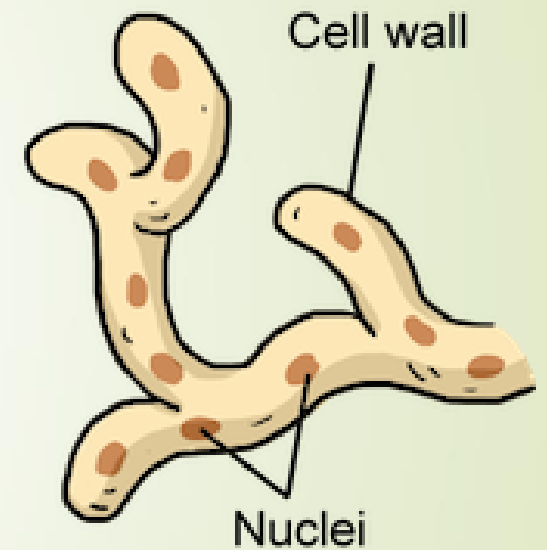
Septated / non septated

According to the presence of septa, hyphae are either:

- ➡ **Septate** (divided into cells by cross walls called septa) or
- ➡ **Non-septate** (not divided by septa).

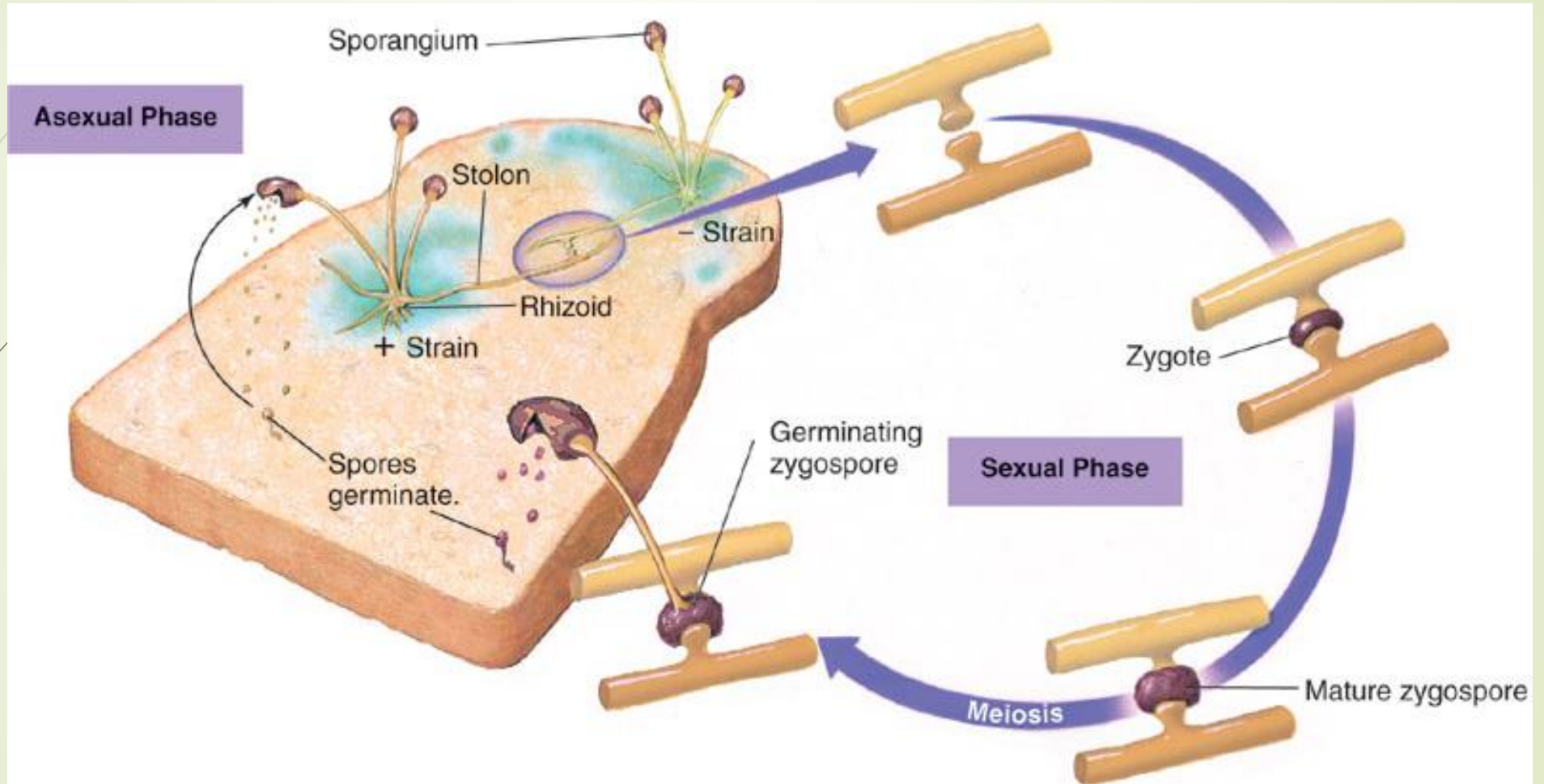


Septate hypha



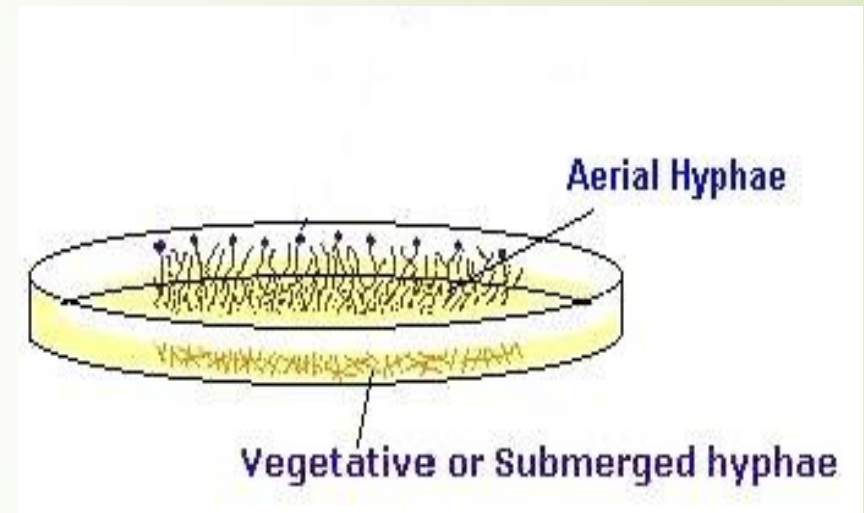
Nonseptate hypha

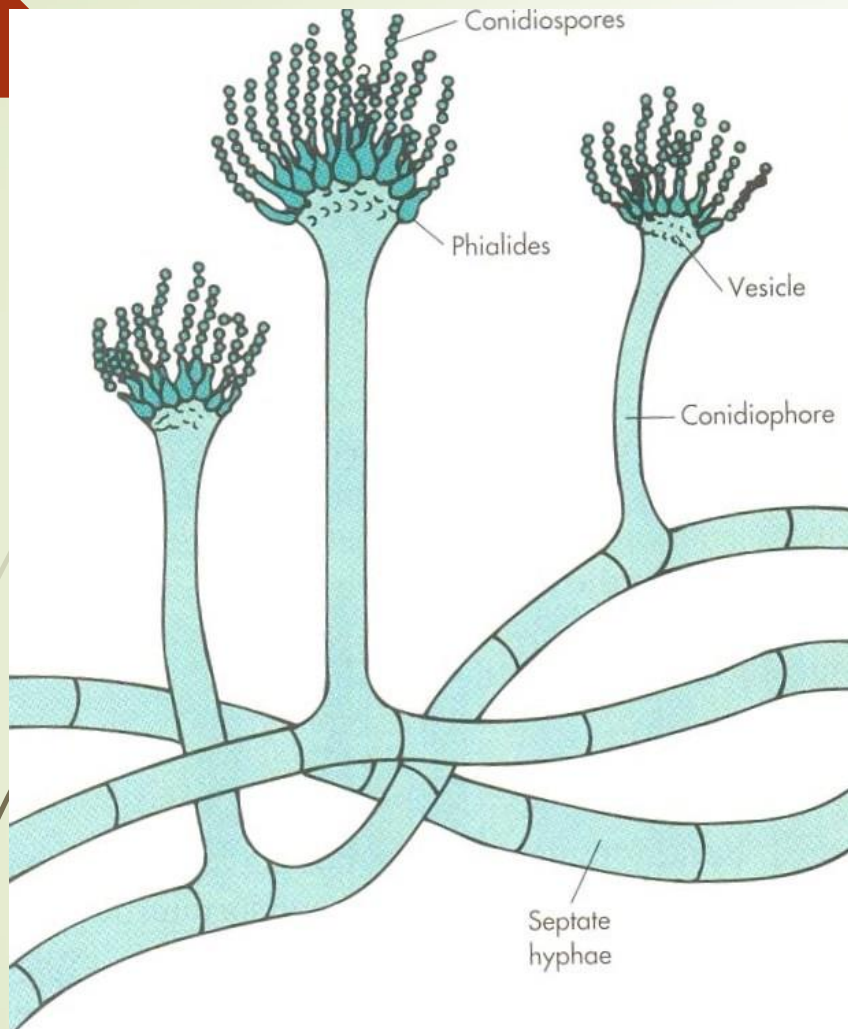
Formation of zygospores in *Rhizopus*



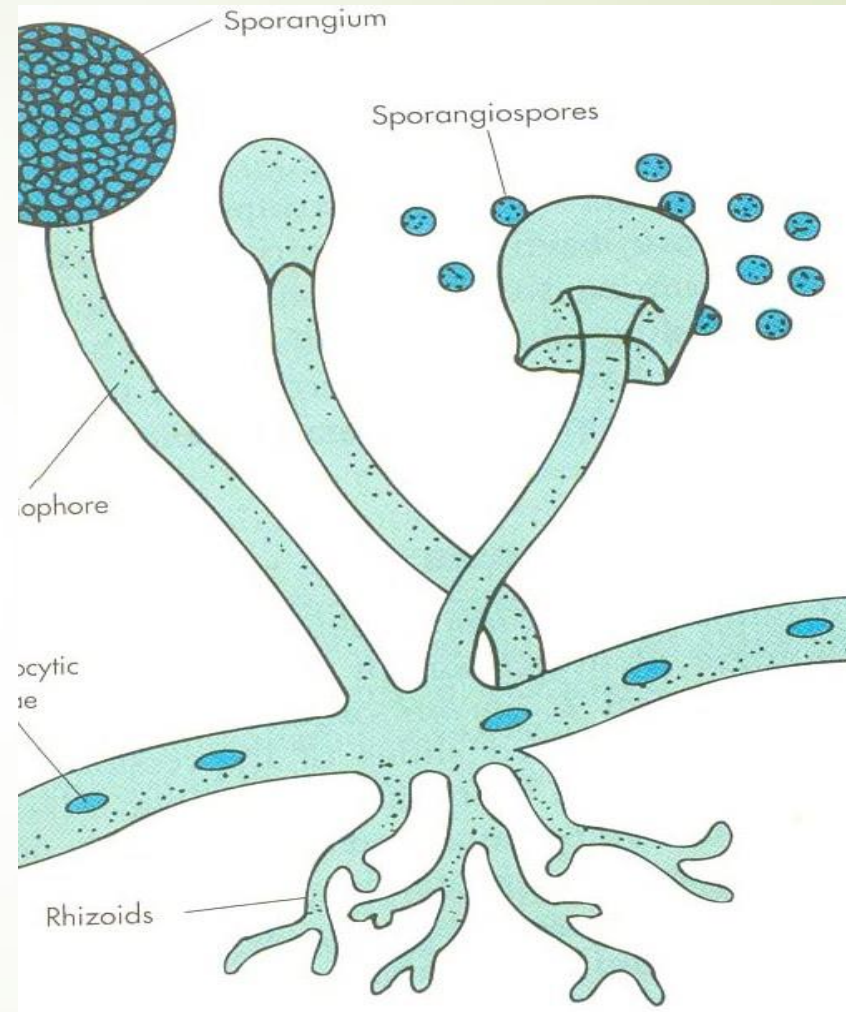
Substrate / aerial hyphae

- 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.





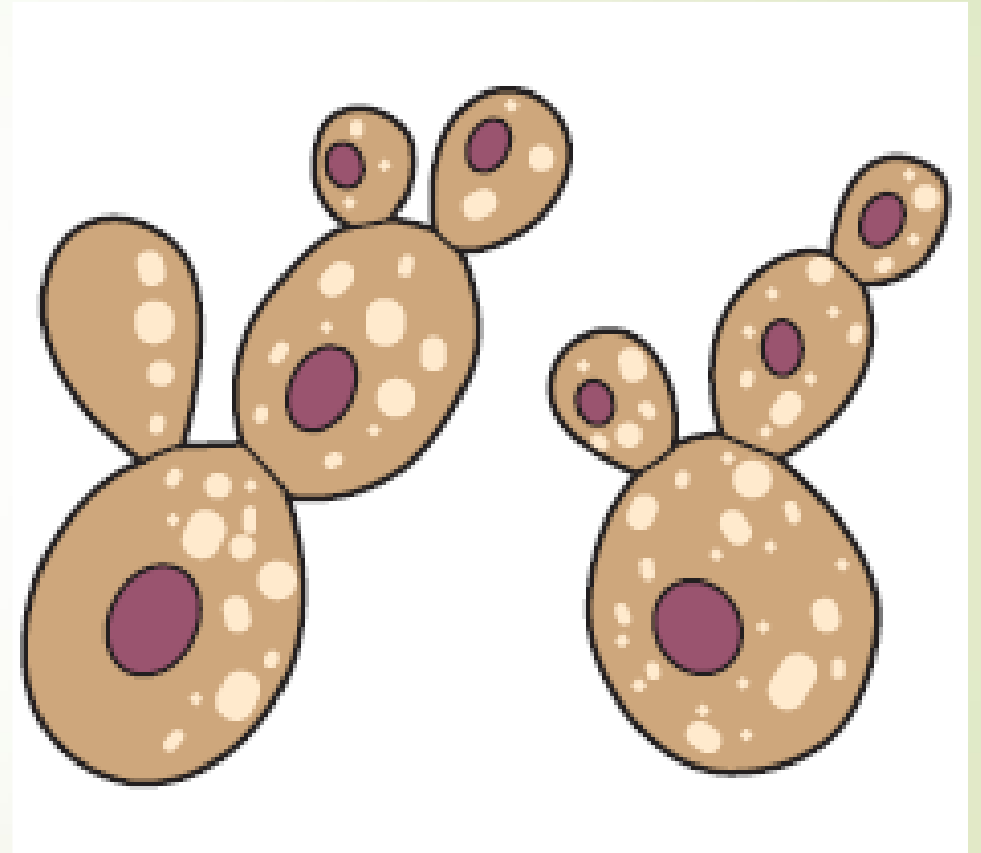
Septate hyphae



Non-Septate hyphae

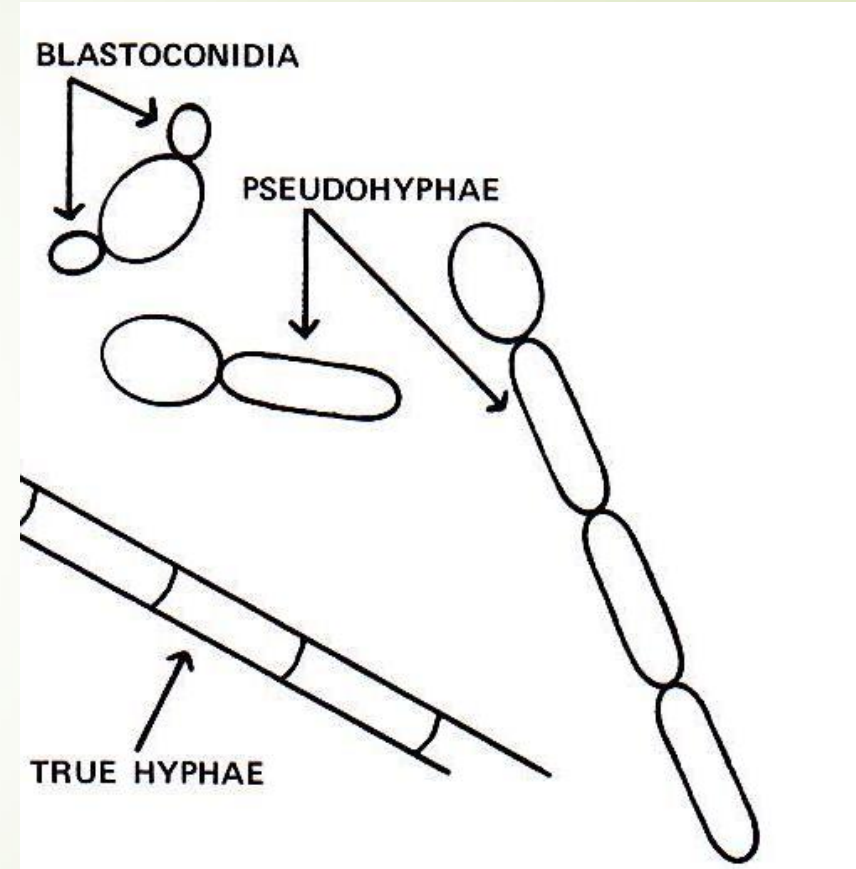
(2) Yeast

- Unicellular fungi.
- Usually spherical to ellipsoid in shape.
- Most yeasts reproduce by **budding**.

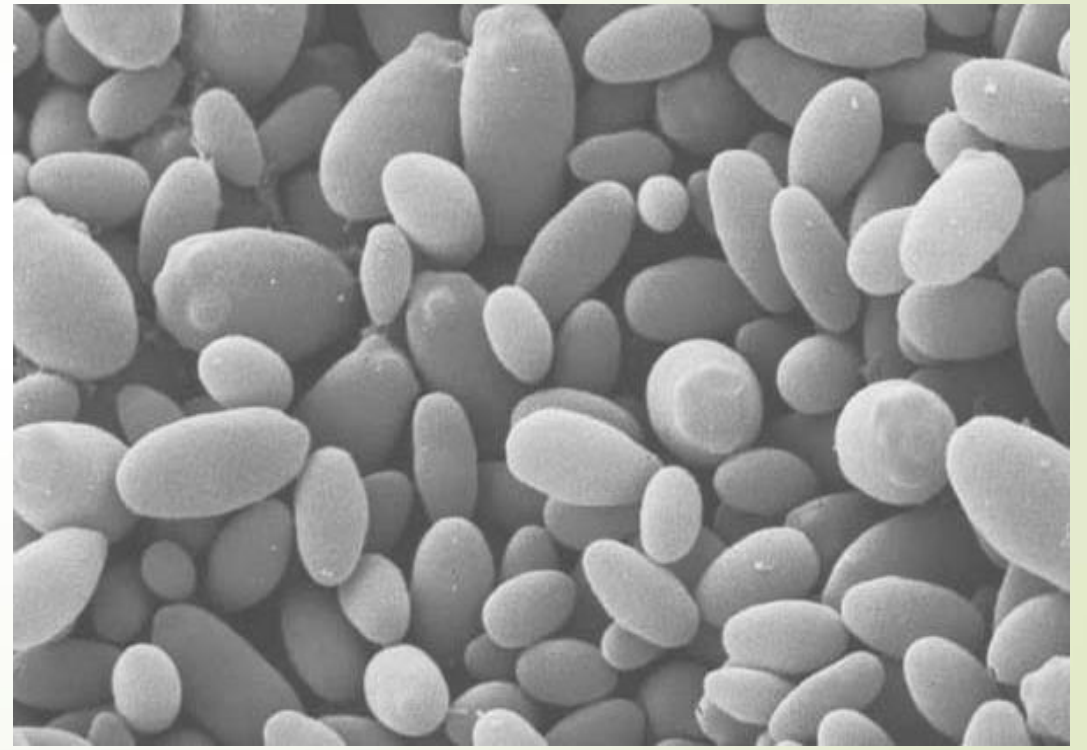
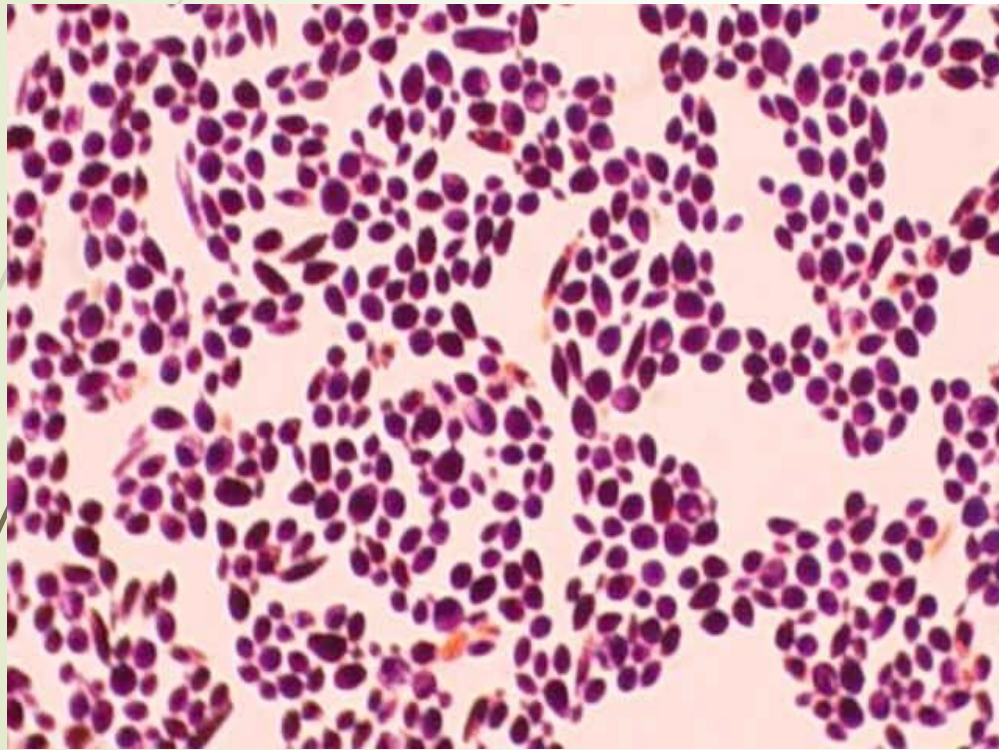


pseudohyphae

- 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





(3) Dimorphic fungi

- Some species of fungi are dimorphic and capable of growth as a **yeast** or **mold** depending on environmental conditions.
- Pathogenic dimorphic fungi are yeastlike at 37°C and moldlike at 25°C

3-Dimorphism

- ▶ Pathogenic dimorphic fungi are yeastlike at 37°C and moldlike at 25°C

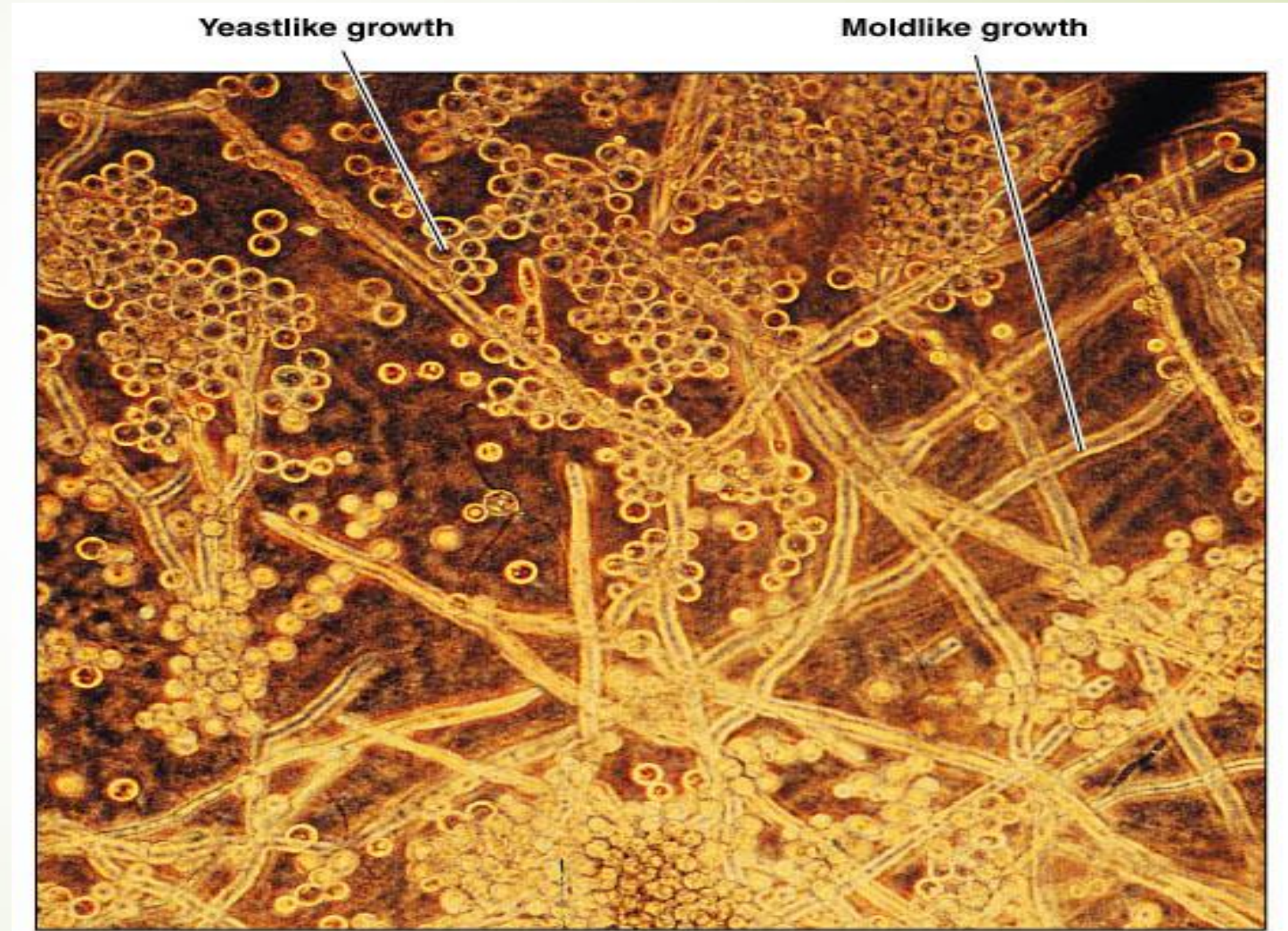


Figure 12.4



Fungal Reproduction

- ➡ Fungi frequently reproduce by the formation of **spores**.
- ➡ The type of spore and the way in which they develop are important in identification and classification of the different species of fungi

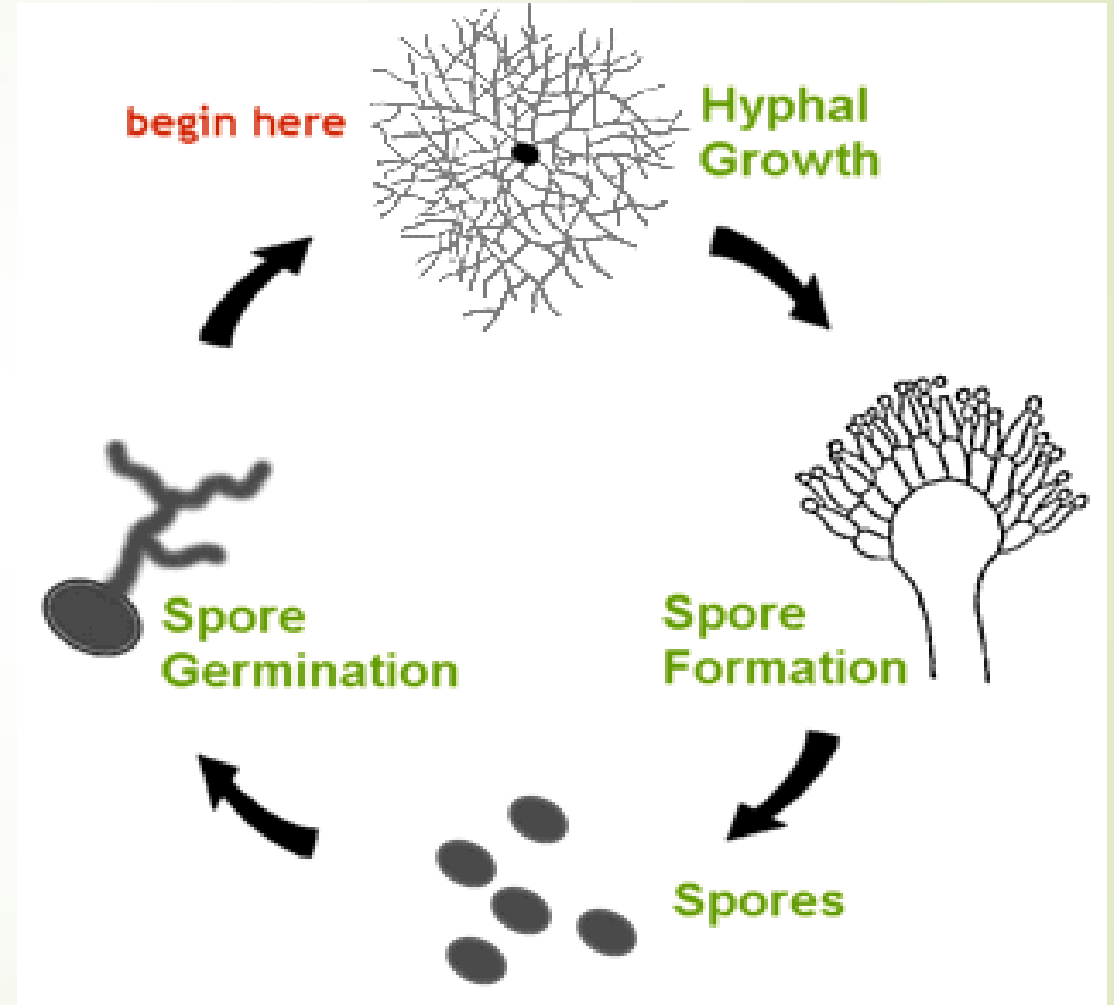
What is a 'spore'?

A reproductive cell that is capable of growing into a new organism by mitotic division alone.

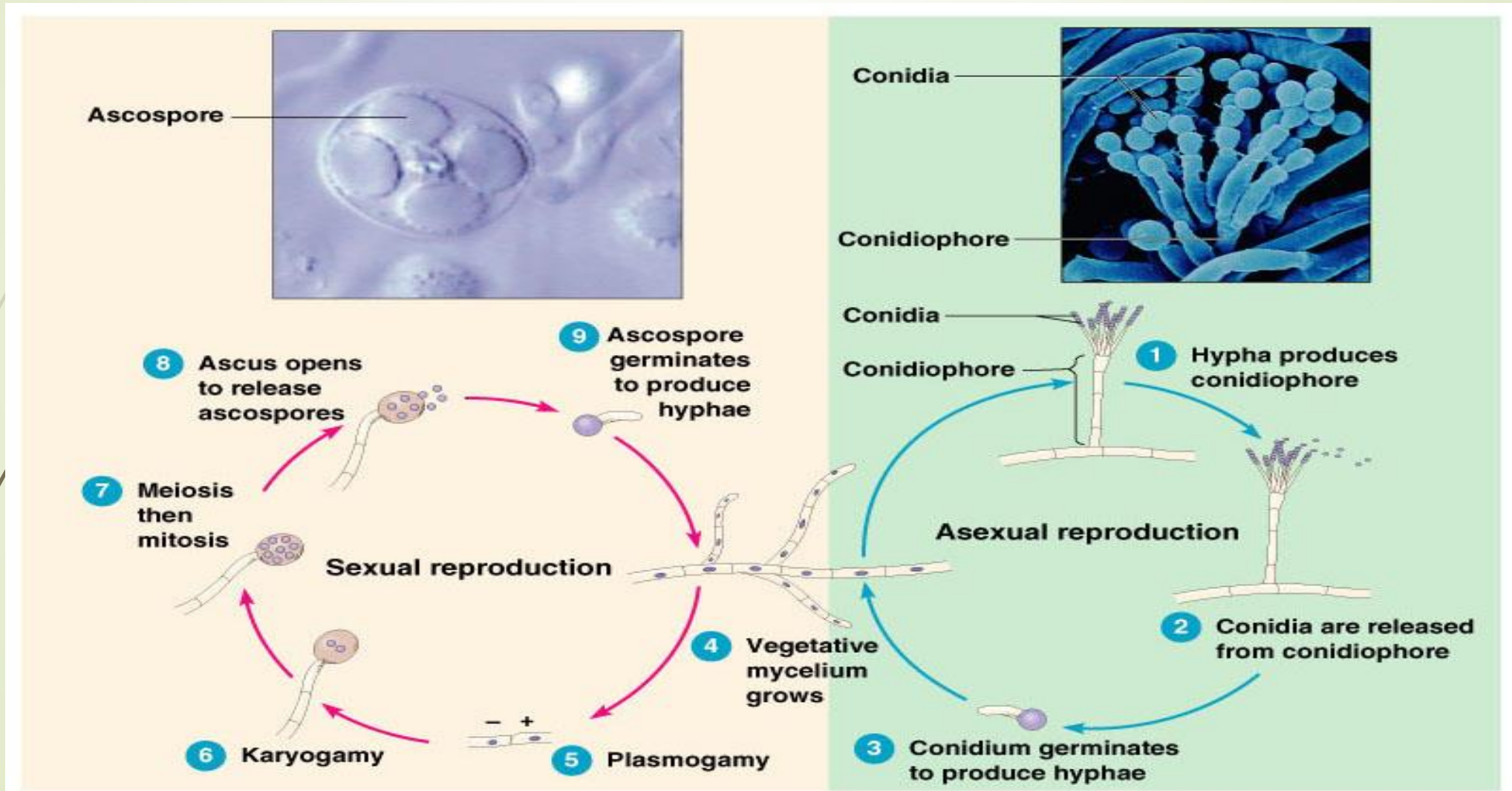


Life Cycle of Mold

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

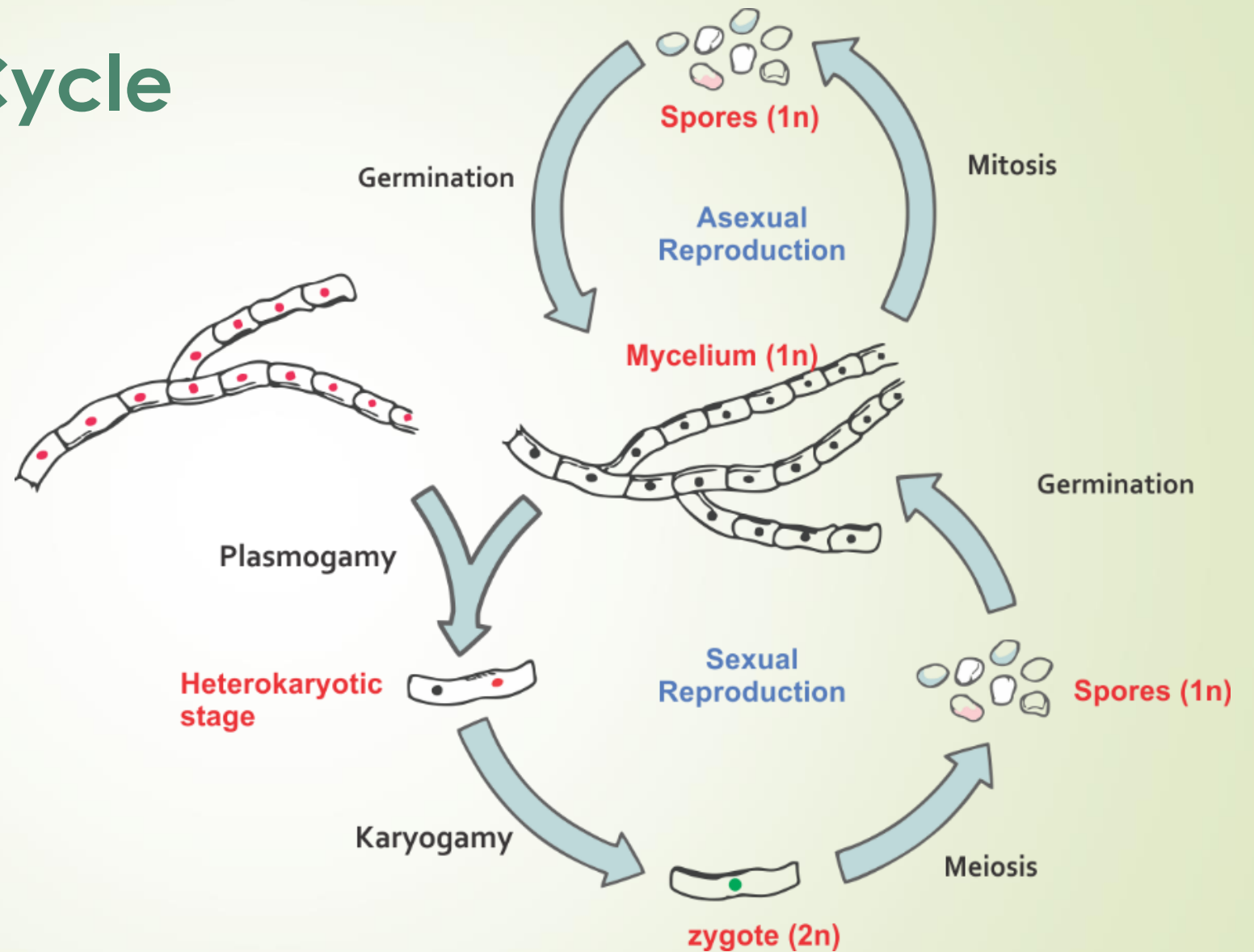


Fungal Life Cycle



Fungal Life Cycle

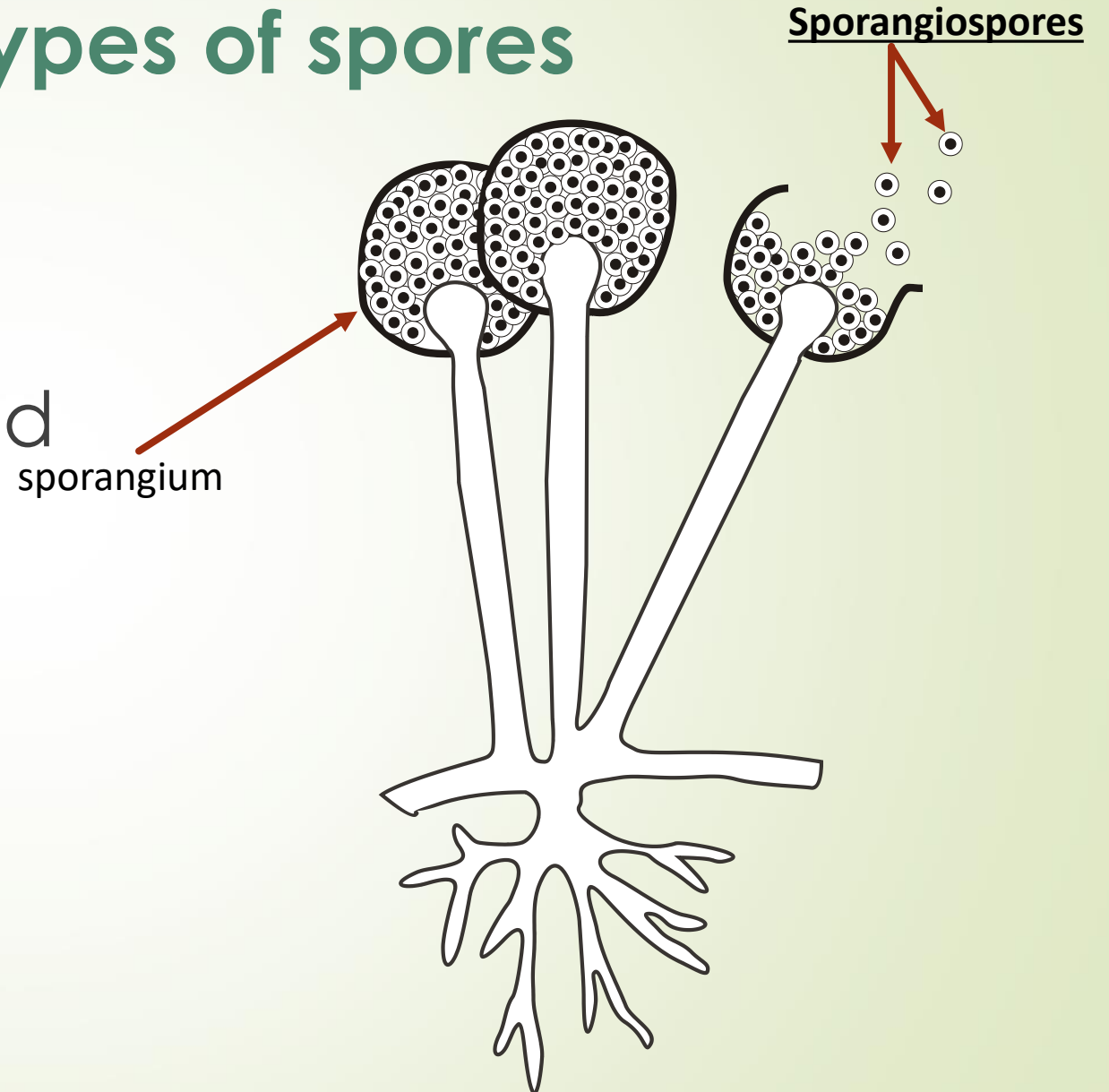
Spores can be produced either from **asexual** or **sexual** reproduction.



Example of Some Types of spores

Sporangiospores:

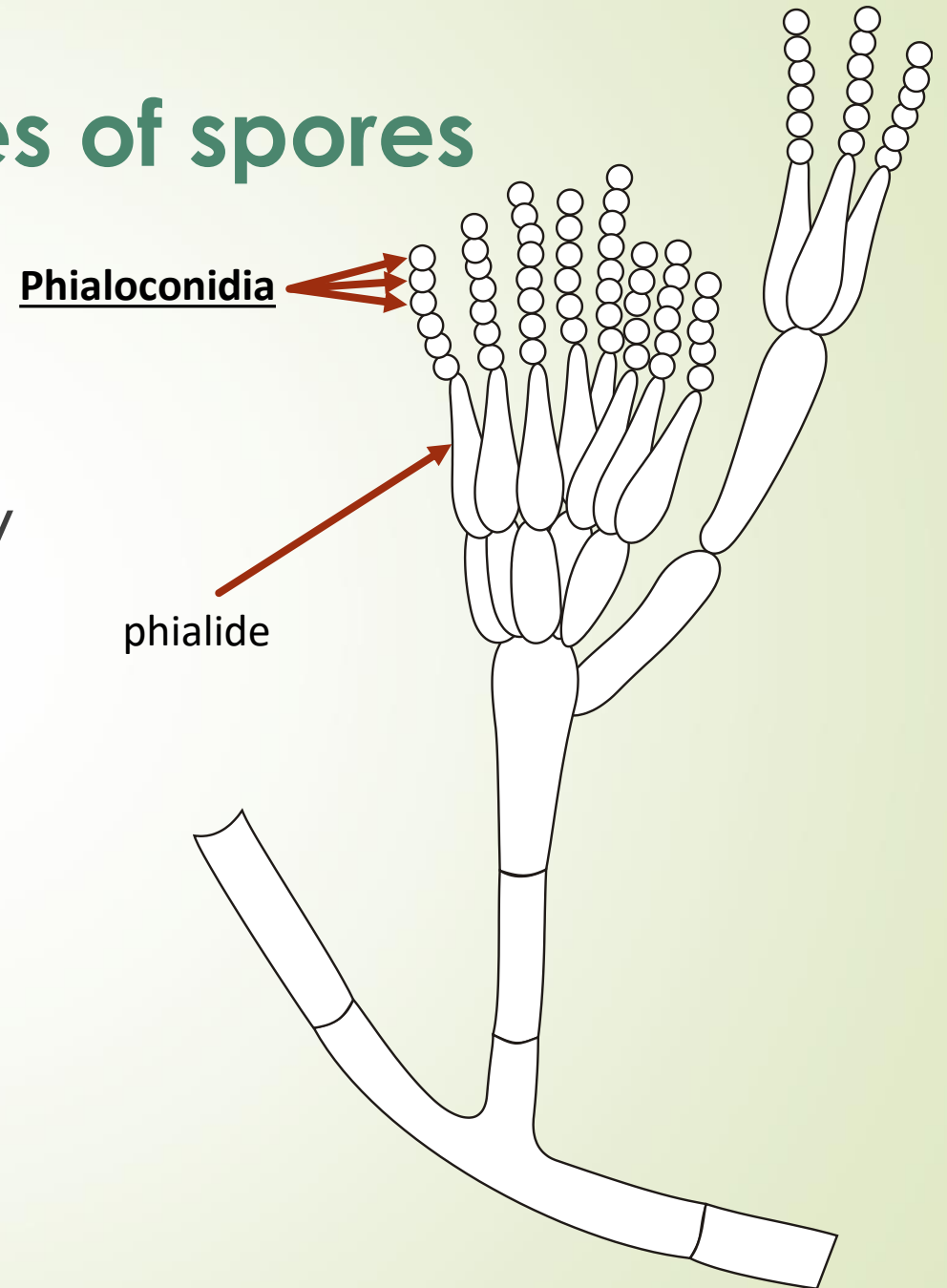
- ➡ Spores may be produced within a sac called a sporangium.
- ➡ The spores within the sporangium are called sporangiospores



Example of Some Types of spores

Phialoconidia:

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



Example of Some Types of spores

Arthroconidia:

- ➡ Conidia that result from the fragmentation of hyphal cells

