

# **Lecture Title:** **Fungi and their pathogenesis**

(Foundation Block, Microbiology)

**Lecturer name: Dr. Ahmed M. Albarraq**

**Lecture Date: Oct.-2018**



# Lecture Objectives..



- To describe the general characteristics of fungi and recognize a fungus from all other living organisms
- To establish familiarity with the terminology needed by medical students
- To know certain fundamental facts about classification reproduction and identification of fungi

# What is Mycology?..



**Mycology:** Study of fungi  
Kingdom myceteae (= Kingdom fungi)

**Medical mycology** : Study of medically important fungi and the mycotic diseases.

**Mycoses:** A disease caused by a fungus

# What is Mycology?



There are five kingdoms

KINGDOM	CHARACTERISTIC	EXAMPLE
Monera	Prokaryocyte	Bacteria Actinomycetes
Protista	Eukaryocyte	Protozoa
Fungi	Eukaryocyte*	Fungi
Plantae	Eukaryocyte	Plants, Moss
Animalia	Eukaryocyte*	Arthropods Mammals Man

# What is a Fungus ?



## Characteristics (distinguishing features)

- 1) All Eukaryotic organisms (a true nucleus)
- 2) Heterotrophic (Saprobic, symbiotic, parasitic)
- 3) Do not have chlorophyll (Achlorophyllous)
- 4) The cell is surrounded by rigid cell wall made of chitin & complex carbohydrates (**Mannan, glucan**)
- 5) Cell membrane : (**sterol, ergosterol**)

# What is a Fungus ?



## Characteristics (distinguishing features)

### Saprobic

feed on dead tissues or organic waste (decomposers)

### Symbiotic

mutually beneficial relationship between a fungus and another organism

### Parasitic

feeding on living tissue of a host. (disease)

# MORPHOLGY



1. **Yeasts** : are unicellular organisms

2. **Filamentous fungi** (Hyphae, mycelium)

Hyphae are multicellular filamentous structures, constituted by tubular cells with cell walls.

3. **Dimorphic**

- Yeast : Parasitic form, Tissue form, Cultured at 37° C
- Filamentous : Saprophytic form, Cultured at 25 C

Dimorphic: Have two forms depending on change in the environmental factors

Mold form  $\xrightarrow{\hspace{1cm}}$  Yeast form  
 $\xleftarrow{\hspace{1cm}}$

# MORPHOLGY

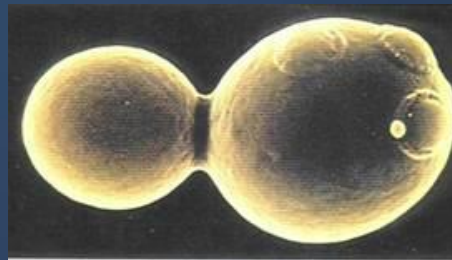


## ➤ Yeast:

### Colony morphology (Culture)



Have same appearance  
How do we differentiate between them?



Budding yeast cell



**In Clinical samples**  
Budding yeast cells  
+/- Pseudohyphae

Examples : *Candida albicans*,  
*Saccharomyces cerevisiae*



# MORPHOLGY



## ➤ Filamentous fungi (Mould=Mold)

A hypha (plural hyphae)

is a long, branching filamentous cell. hyphae are the main mode of vegetative growth.

**Mycelium:**

The intertwined mass of hyphae that forms the fungal colony.

**Conidia/ Spore (singular = conidium):**

asexual spores borne externally on hyphae or on a conidiophore.

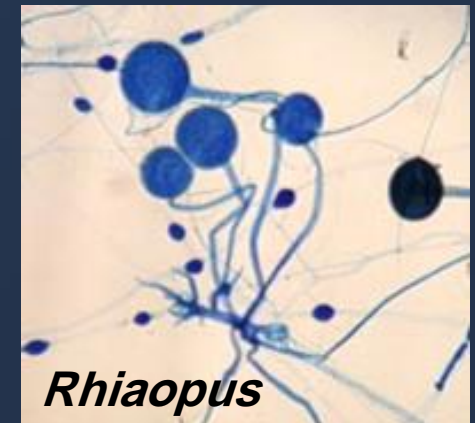
**Examples:**

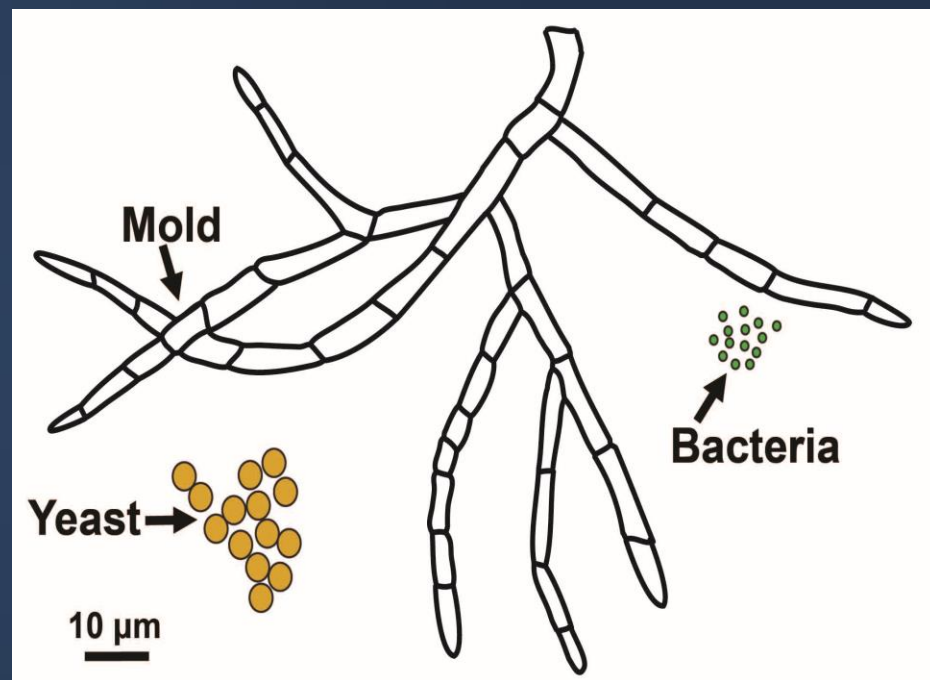
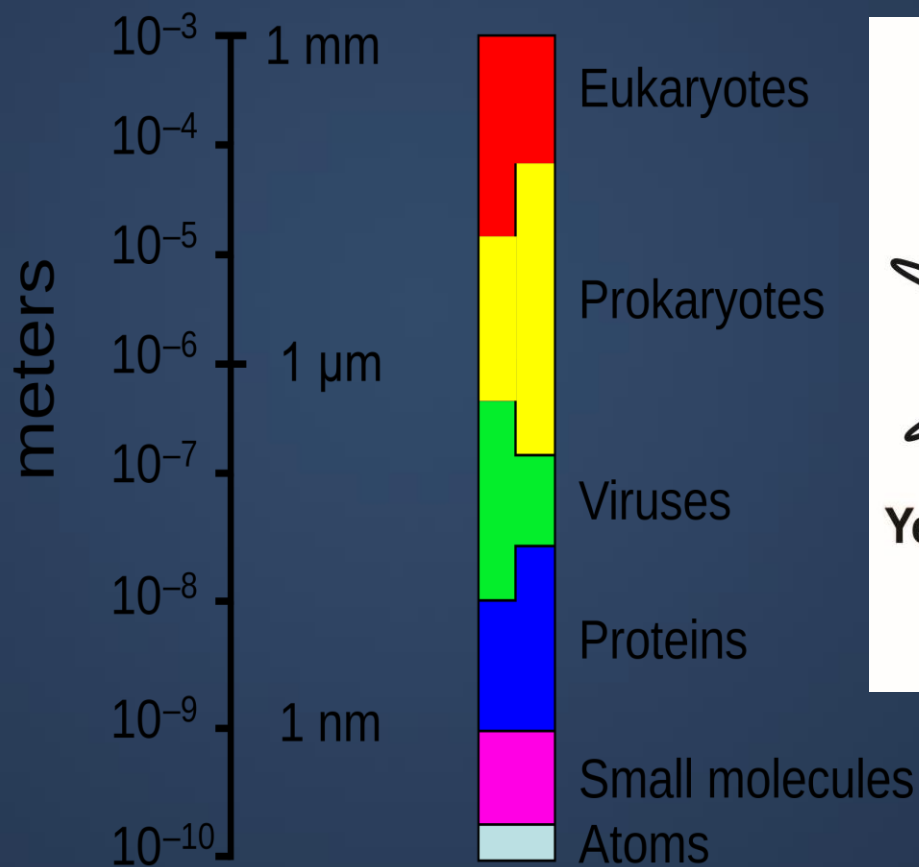
*Aspergillus,*  
*Penicillium,*  
*Rhizopus*

# MORPHOLOGY



## ➤ Filamentous fungi



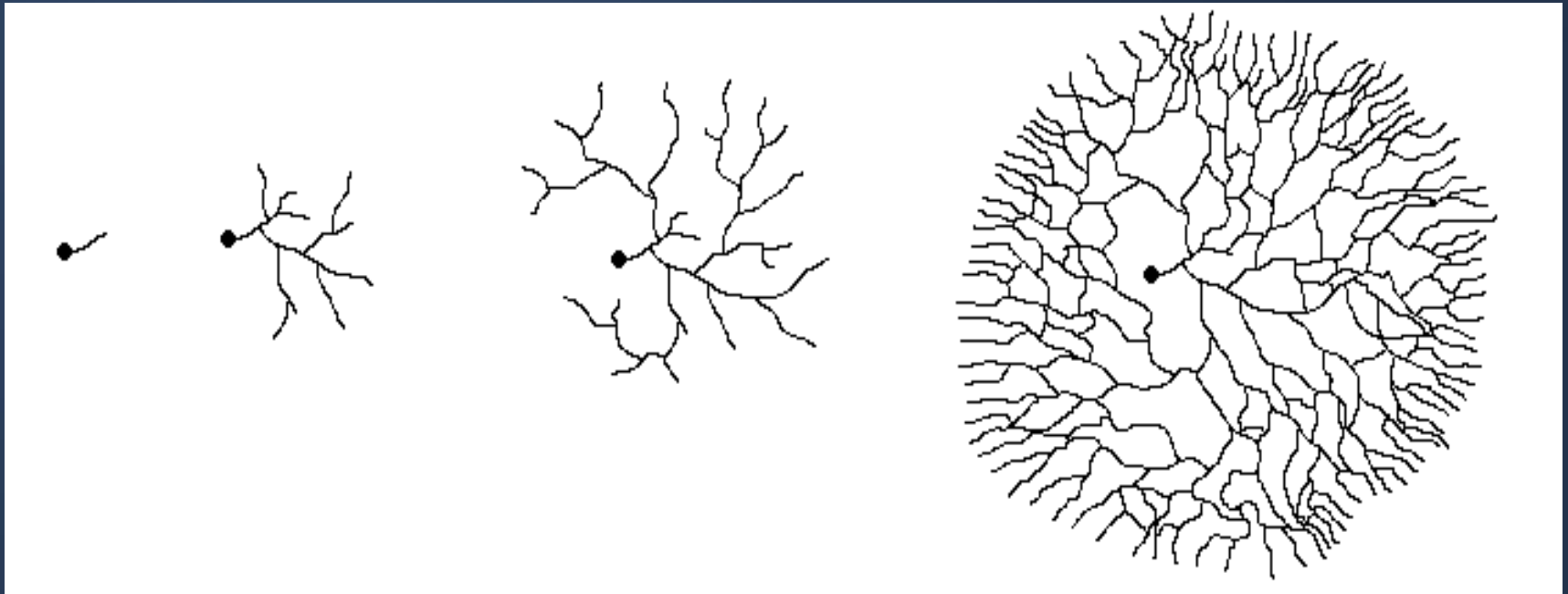


# MORPHOLOGY



## ➤ Filamentous fungi

Hyphal growth from spore

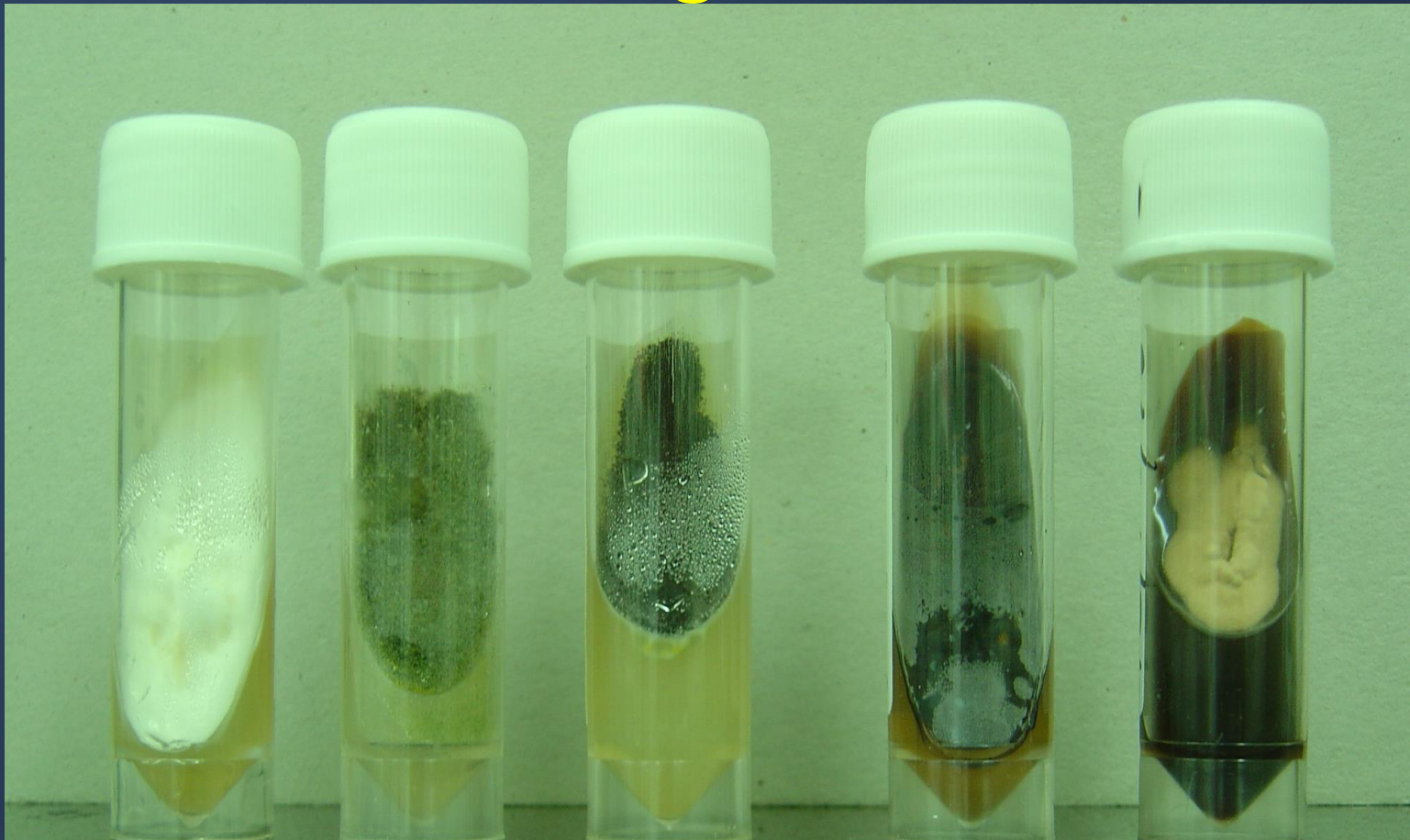


Spore/ conidia

mycelium

# MORPHOLOGY

## ➤ Filamentous fungi



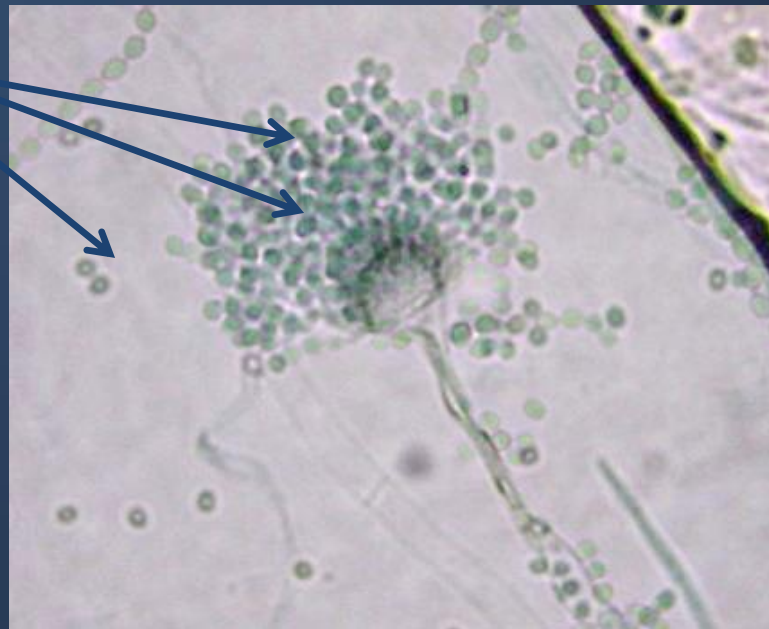
# MORPHOLOGY



## ➤ Filamentous fungi

**Conidia / spore (singular = conidium):** asexual spores borne externally on hyphae or on a conidiophore.

**Conidia**



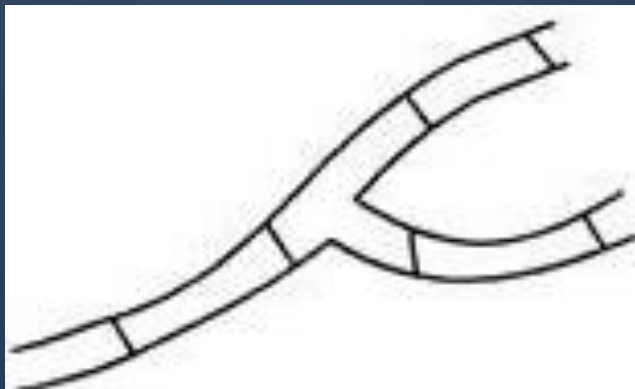
# Fungal Hypha

## ➤ Filamentous fungi

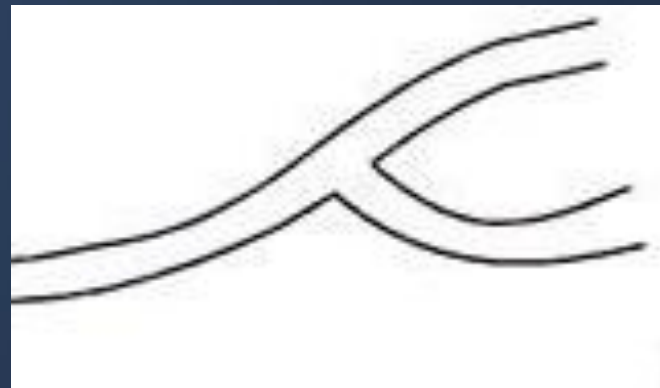
### Septa:

Cross-walls (septa) that divide hyphae into segments. (septate hypha)

If there are no cross-walls, the hyphae are considered to be non-septate.



Septate hypha



Non-Septate hypha

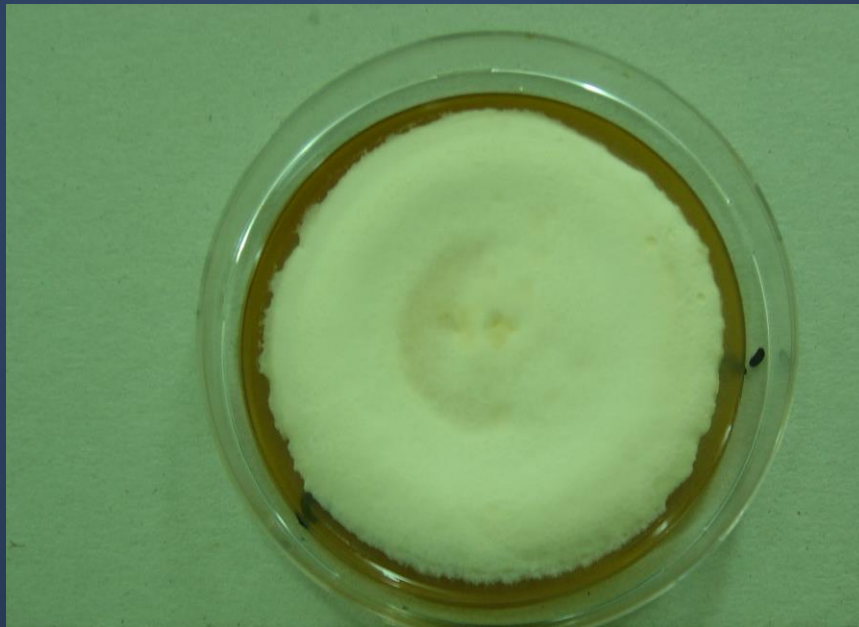
# MORPHOLOGY



## ➤ Filamentous fungi (mold)

### Moniliaceous mold

hyaline or lightly pigmented conidia or hyphae, colorless

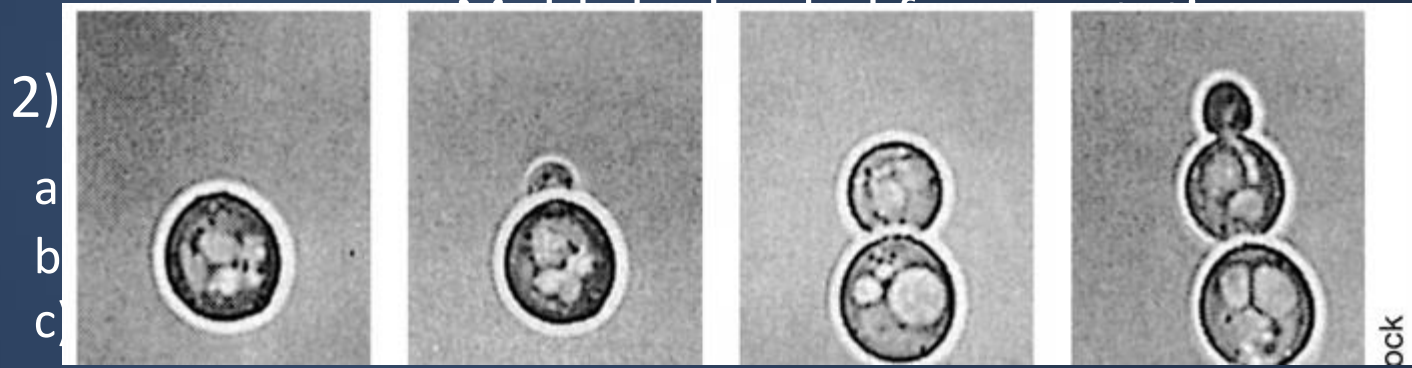




# Reproduction in Fungi

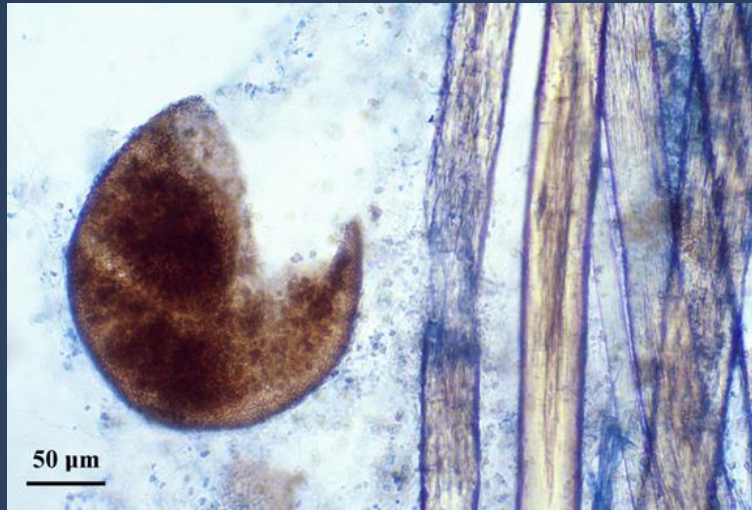
## I) Asexual: Only mitotic cell division

### 1) Somatic Yeasts by budding



## II) Sexual: Fusion, mitosis, meiosis

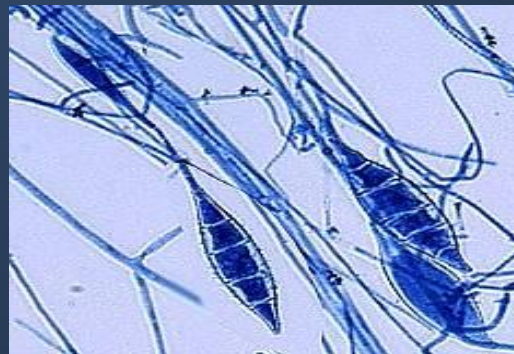
# Reproduction in Fungi



# Spores?

- These are the small airborne particles by which fungi reproduce.
- They are produced by mitosis and readily disseminate in the air.

## SPORES



# PATHOGENICITY OF FUNGI



However, fungi can cause diseases to humans

Cause superficial infections,  
some can cause allergic reactions  
Few cause invasive infections

To cause the disease:

1. Thermotolerance
2. Ability to survive in tissue environment
3. Ability to withstand host defenses

# Thank You 😊

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