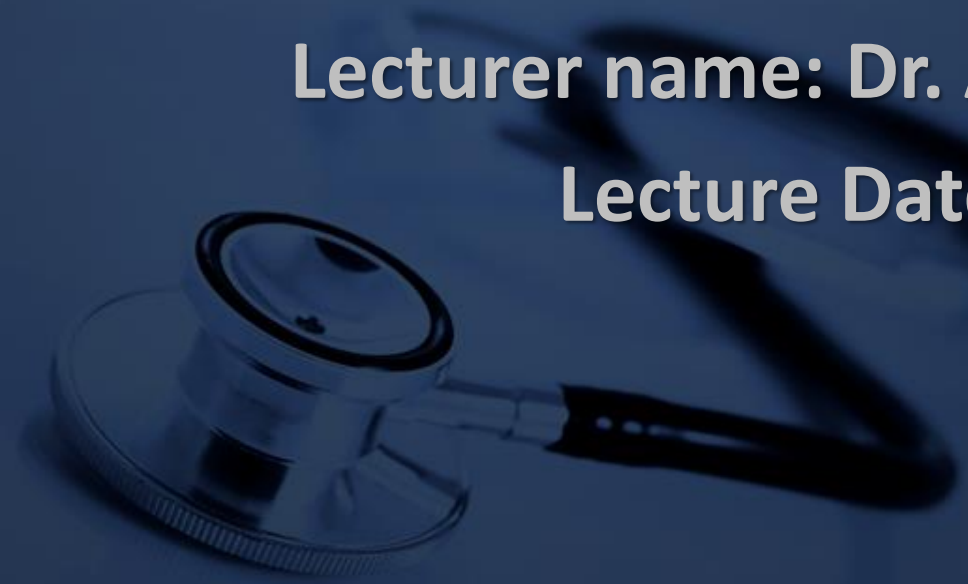
Lecture Title:
Fungi and their pathogenesis

(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 carbohydates (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)

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

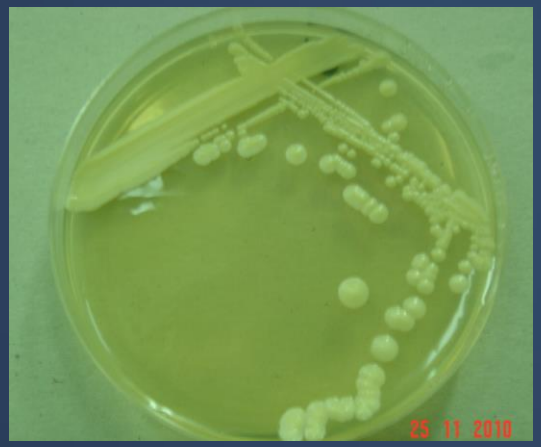
3. Dimorphic
   - Yeast : Parasitic form, Tissue form, Cultured at 37° C
   - Filamentous : Saprophytic form, Cultured at 25 C

   Dimorphic: Have two forms depending on change in the environmental factors Mold form ⇄ Yeast form

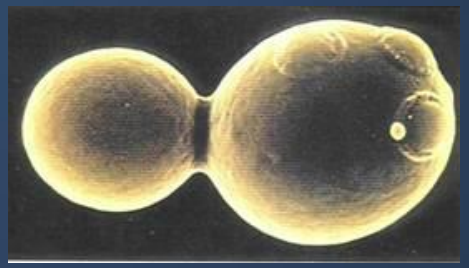
MORPHOLGY

➢ Yeast:

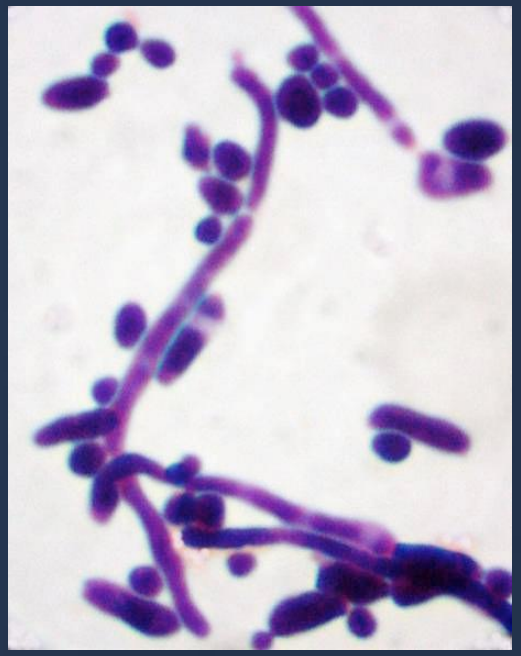
Colony morphology (Culture)



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):

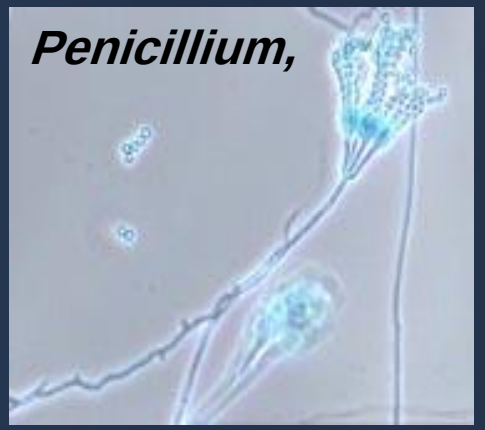
asexual spores borne externally on hyphae or on a conidiophore.

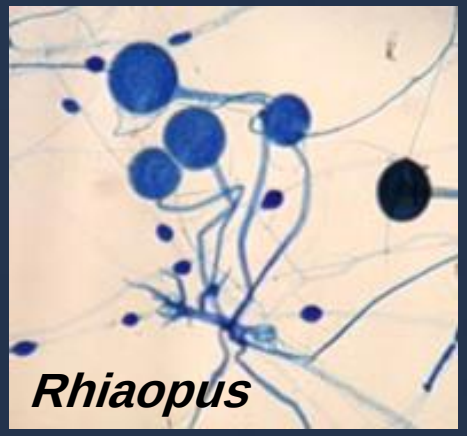
Examples:

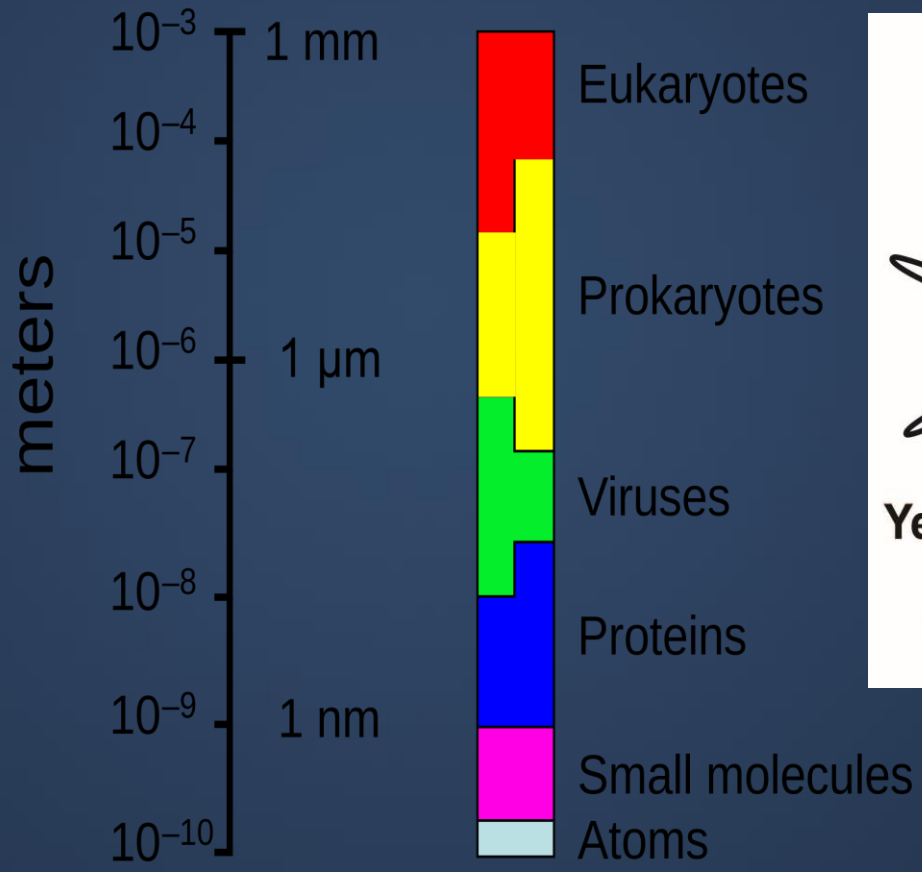
Aspergillus,
Penicillium,
Rhizopus

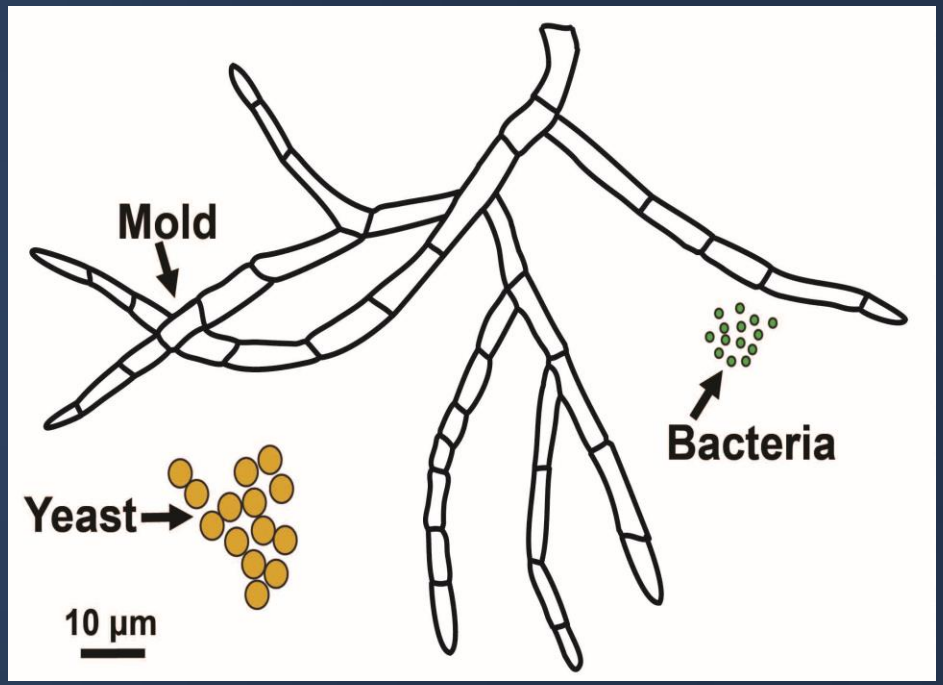
MORPHOLGY

- Filamentous fungi





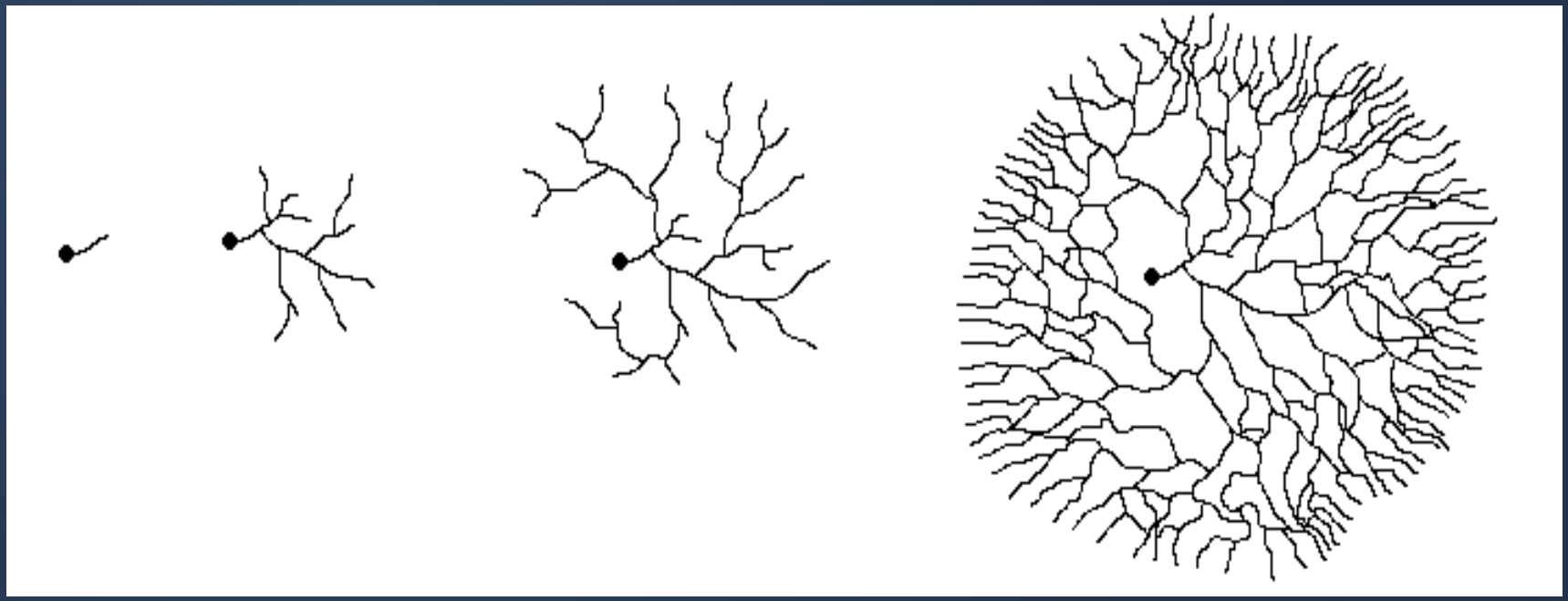

meters
10^{-3}
1 mm
10^{-4}
10^{-5}
10^{-6}
1 µm
10^{-7}
10^{-8}
10^{-9}
1 nm
10^{-10}
Eukaryotes
Prokaryotes
Viruses
Proteins
Small molecules
Atoms


Mold
Bacteria
Yeast
10 µm

MORPHOLGY

- Filamentous fungi

  Hyphal growth from spore

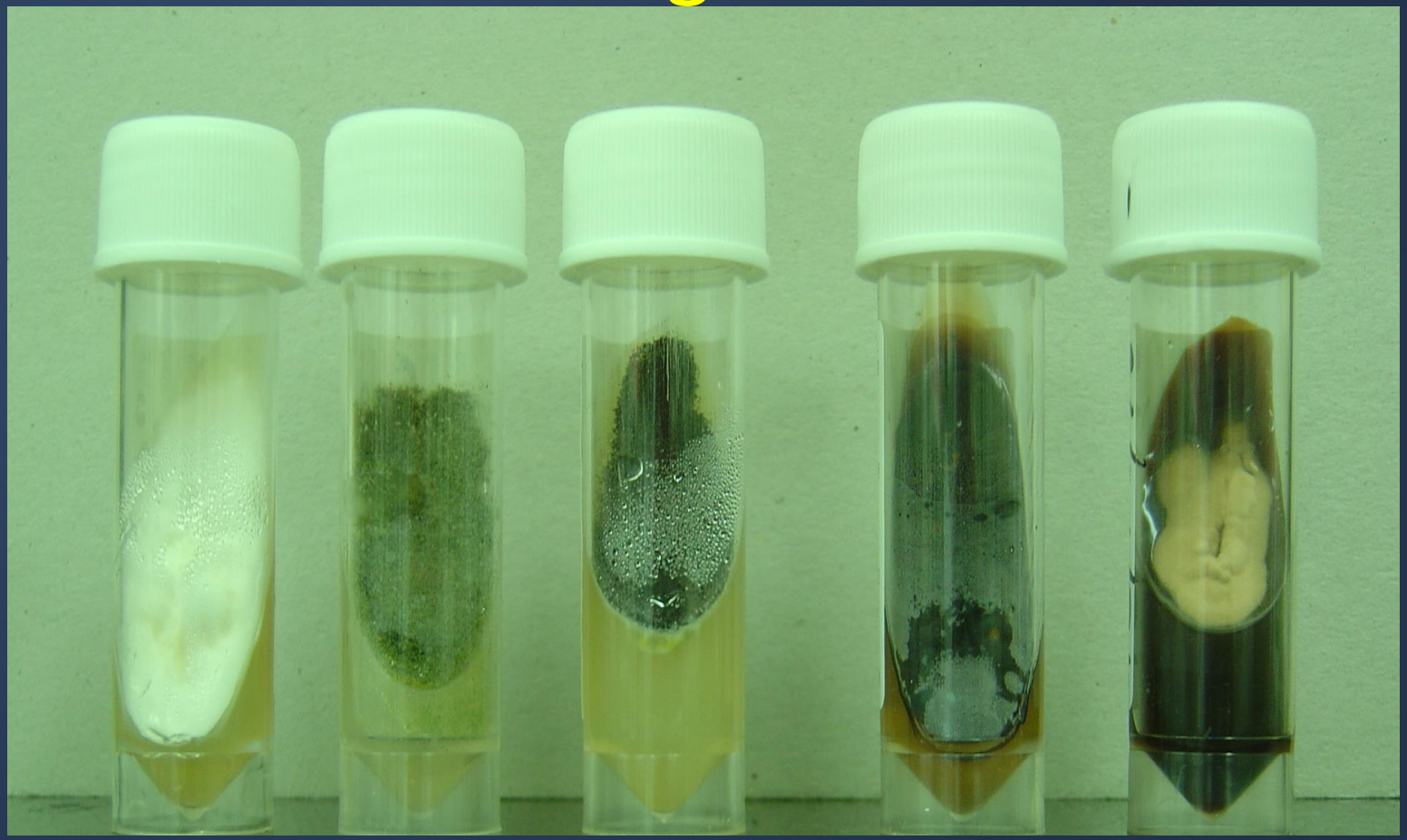


Spore/ conidia

mycelium

MORPHOLGY

- Filamentous fungi

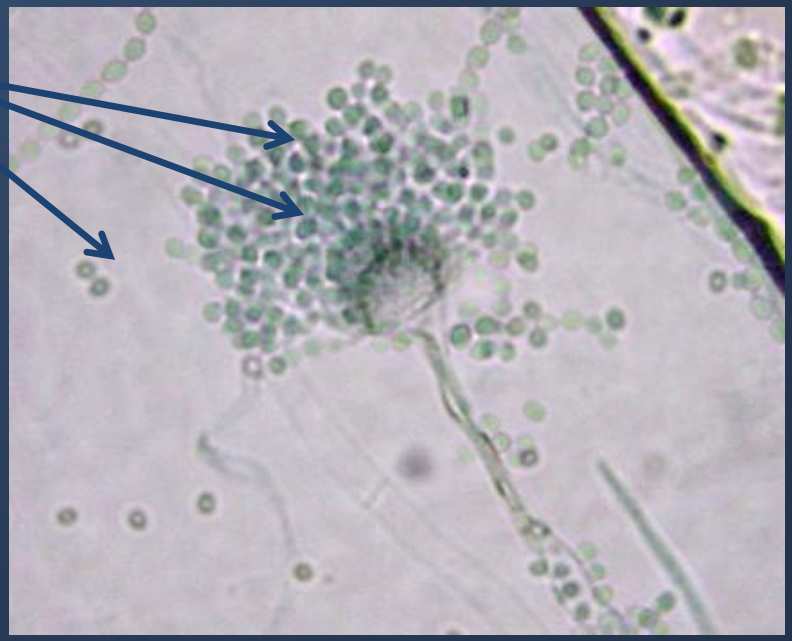


MORPHOLGY

➢Filamentous fungi

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

Conidia



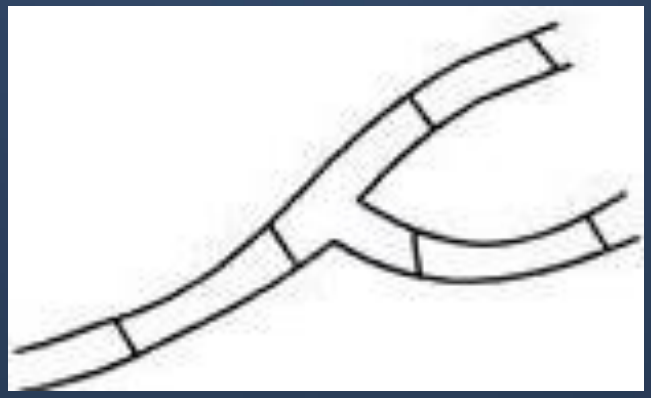
Fungal Hypha

- 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

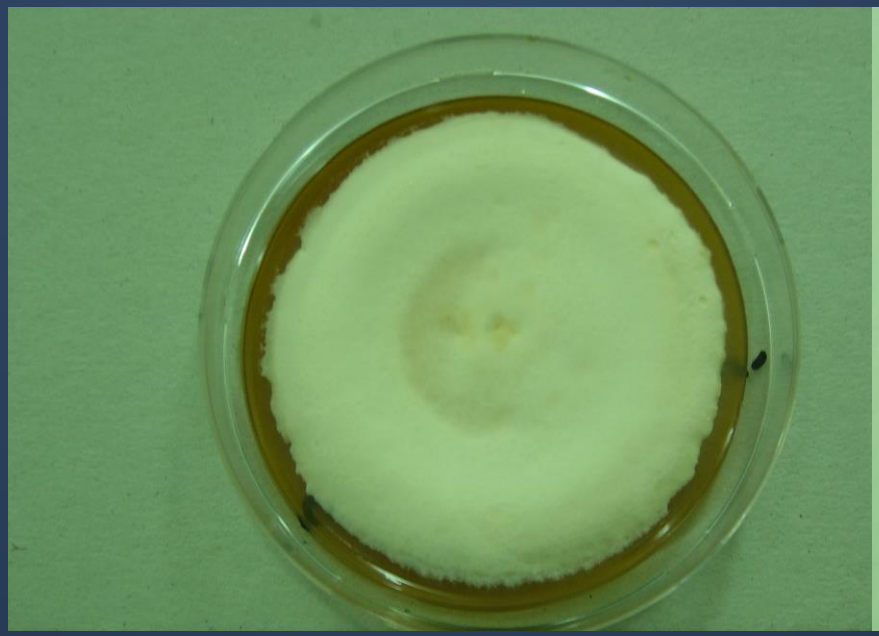
Non-Septate hypha

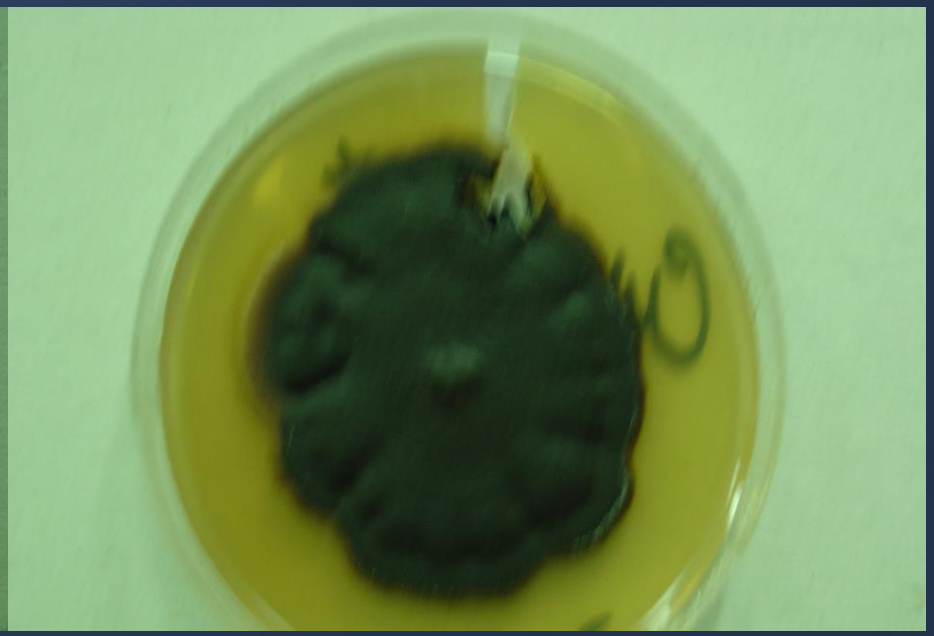
MORPHOLGY

➢ 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

2)

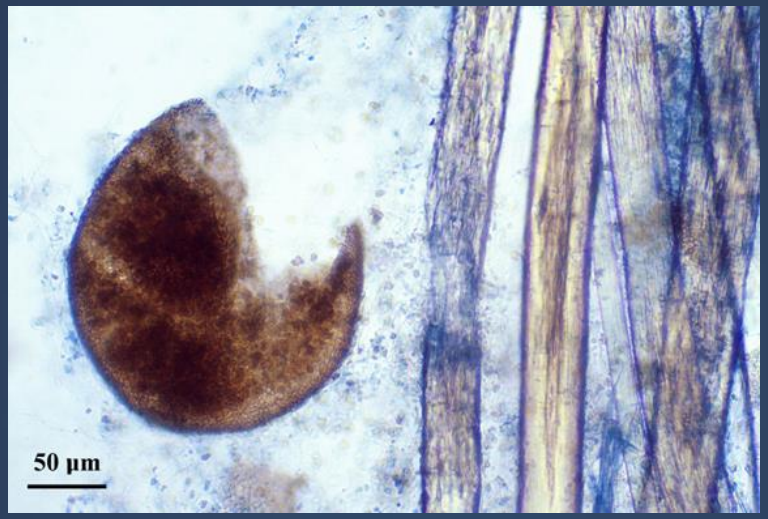
a

b

c)

II) **Sexual:** Fusion, mitosis, meiosis

Reproduction in Fungi

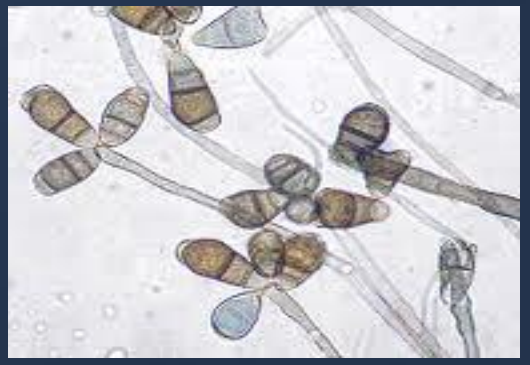


Spores?

-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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Dr. Ahmed M. Albarraq

Oct.-2018