MED437
KING SAUD UNIVERSITY

MICROBIOLOGY
437

Microbiology – Lecture 10
Fungi and their pathogenesis

TEAM 437

Red: important
Green : doctor notes
Black : original slides
Grey: extra information

In this link, you will find any corrections or notes unmentioned in the team's work. Please check the link below frequently.

https://docs.google.com/presentation/d/1yIQt3G8UDFG6xYMRhXkTk-dS54NeTfhJaPe_y0M-kjk/edit?usp=sharing

Objectives

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- 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

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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 a Fungus ?

Characteristics of fungi:

1) All Eukaryotic organisms (a true nucleus)
2) Heterotrophic(doesn't make their own food)
(Saprobic, symbiotic, parasitic)
3) Do not have chlorophyll (Achlorophyllous)
4) The cell is surrounded by rigid cell wall made of chitin and complex carbohydrates (Mannan, glucan)
5) Cell membrane : (sterol, ergosterol)

Characteristics of fungi (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)

More info on fungi

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MORPHOLOGY

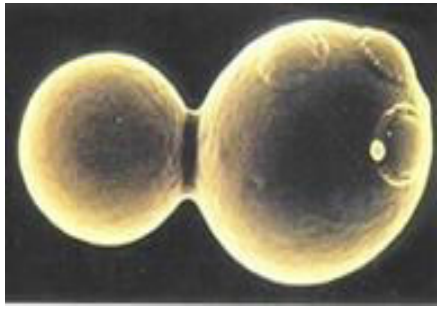
Yeasts

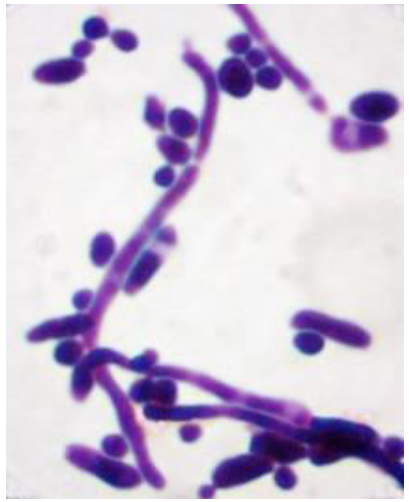
- are unicellular organisms (round oval)
- Colony morphology (Culture)

Examples :Candida albicans (found as normal flora)
Saccharomyces cerevisiae (found in baking powder)

- Yeast is 5 times larger than bacteria

Budding yeast cell





Clinical samples :
Budding yeast cells
+\- Pseudohyphae

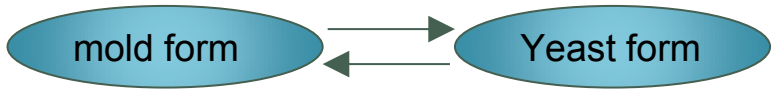
Filamentous fungi
mold form
(Hyphae, mycelium)

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

Dimorphic (between yeast and filamentous)

- **Yeast** : Parasitic form, Tissue form, Cultured at 37°C
- **Filamentous** : Saprophytic (micro-organisms that live on dead or decomposing matter.) form, Cultured at 25 C

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



Morphology Of Filamentous Fungi (mold)

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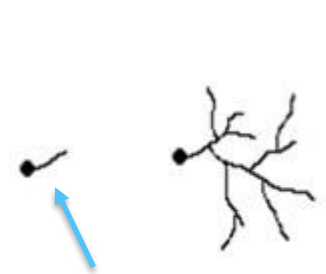
- **A hypha** (plural hyphae) is a long, branching filamentous cell. hyphae are the main mode of vegetative growth.
- **Mycelium**: The intertwined mass of hyphae that forms the fungal colony.
- **Conidia/ Spore: (singular=conidium)** asexual spores borne externally on hyphae or on a conidiophore.

Examples:

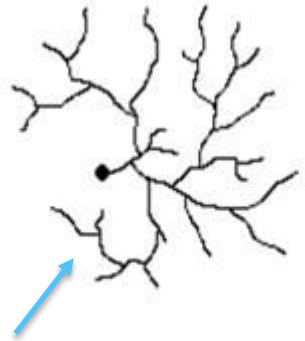
- Aspergillus very common pathogenic filamentous fungi

Penicillium synthesize penicillin

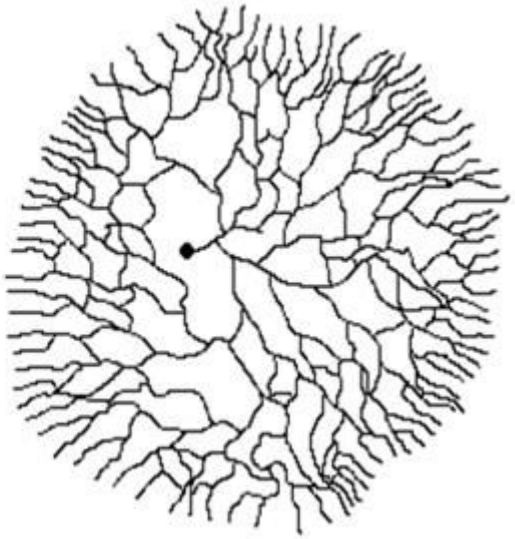
Rhizopus causes black bread mold



Spore/conidia



Hyphal growth from spore

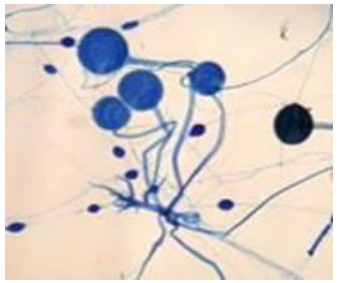


Mycelium a mass of hyphea

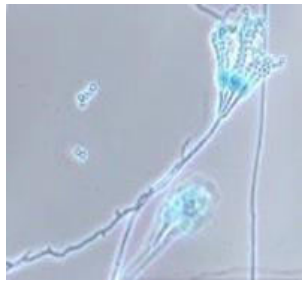
Microscopy

Conidia

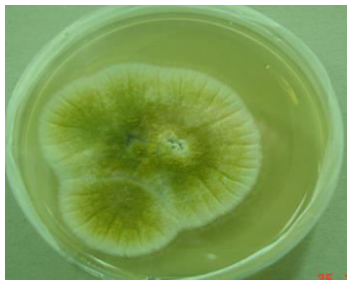
Rhizopus



Penicillium



Cell Culture



Filamentous fungi

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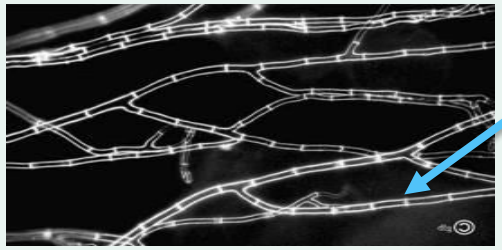
Moniliaceous molds	Dematiaceous Mold	Fungal Hypha
hyaline or lightly pigmented conidia or hyphae, colorless	Are *pigmented*. Because of the pigment, the colonies appear dark, brown, or black	Septa : 1) Septate-hypha: Cross-walls (septa) that divide hyphae into segments 2) Non-septate: If there are no cross-walls



Reproduction in fungi

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Spores can remain dormant till the conditions are favorable for it to grow.

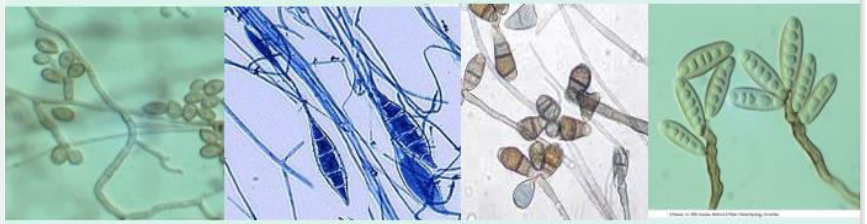
Asexual: Only mitotic cell division

1) Somatic (production of daughter cell, genetically the same)	2) Spore formation:
1. Yeasts by budding. 2. Molds by hyphal fragmentation	1. Sporangiospores in sporangia 2. Chlamydospores in or on hyphae 3. Conidia (conidium) on hypha or on conidiophores

- **Spores**

-These are the small airborne particles by which fungi reproduce.

-They are produced by mitosis and readily disseminate in the air.



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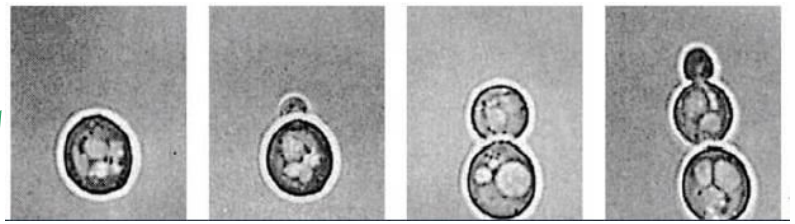
Sexual: Fusion, mitosis, meiosis



Spore produces filaments which grow to mycelium.

Pathogenicity of fungi

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Fungi are all around us
Widely distributed in nature (air, water, soil, decaying organic debris)

Fungi can cause diseases to humans

I. Cause superficial infections,

II. some can cause allergic reactions

III. Few cause invasive infections

Not all fungi are pathogenic

If fungi cannot live at 37 degrees then it cannot cause diseases in humans, it may cause superficial diseases though

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Fungi

Characteristic of fungi

- Eukaryotic
- heterotrophic
- Achlorophyllous
- Cell wall
  - chitin
  - Cmplix crpohydates
    - mannan
    - glucan
- Cell membrane
  - sterol
  - ergosterol

Reproduction in fungi

- A sexual
  - somatic
  - Spore formation
- sexual
  - fusion
  - mitosis
  - meiosis

Pathogenicity of fungi

- Fungi can causes diseases to humans
  - Superficial infection
  - Allergic reaction
  - Invasive infection
- Not all fungi are pathogenic to cause the disease
  - Thermotolerarce
  - Ability to survive in tissue environment
  - Ability to withstand host defenses

Quiz and references

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1- Cell wall of fungi is made of chitin and complex…….

A- Protein B- Carbohydrate D- Fatty acid

2..... are examples of fungi:

A- Actinomycosis B- Schistosomiasis C- Aspergillus

3.Fungi are prokaryotic organisms.

A- T B- F

4.Candidium is sexual spore.

A- T B- F

5.Mold divides asexually by

A- Hyphal fragmentation B- Budding C-fusion

6.Yeast is a multicellular organism

A- T B- F

7.Dermatiaceous molds are hyaline or lightly pigmented conidia.

A- T B- F

8.Cross cell wall can occur only in Non septate hypha

A- T B- F

9.Fungi divides sexually by

A- Spores. B- Somatic C- Mitosis

Sherries **Medical Microbiology, an Introduction to Infectious Diseases.**

Latest edition, Kenneth Ryan and George Ray. Publisher : McGraw Hill .

1- B, 2-C, 3-B, 4-B, 5-A, 6-B, 7-B, 8-A, 9-C

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