MEDICAL MYCOLOGY 2016-2017

INTRODUCTION TO MEDICAL MYCOLOGY

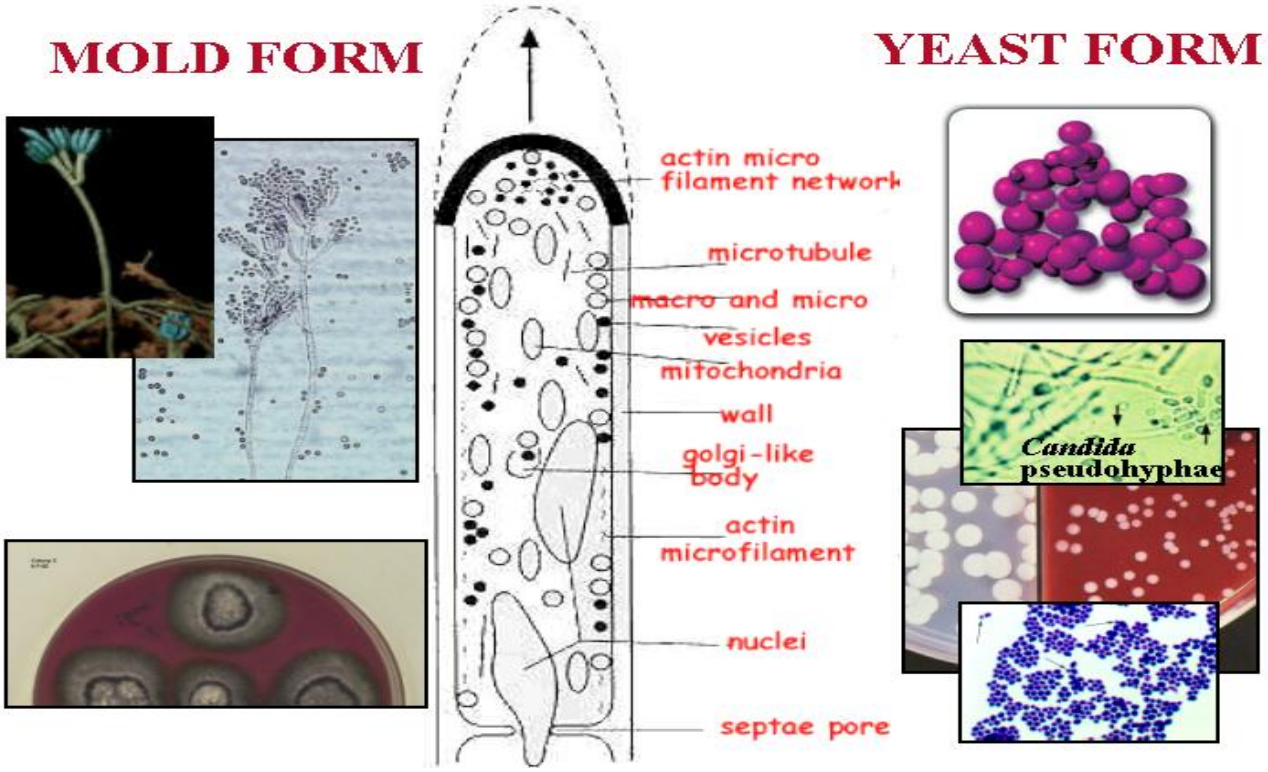
. FUNGI

- Diverse group of heterotrophs. Many are ecologically important saprophytes (consume dead and decaying matter), Others are parasites
- Dimorphic ,most are multicellular (mold), but yeasts are unicellular.
- Most are aerobes or facultative anaerobes. Cell walls are made up of chitin (polysaccharide). Over 100,000 fungal species identified. Only about 100 are human or animal pathogens .Most human fungal infections are nosocomial and/or occur in immunocompromised individuals (opportunistic infections).

Fungal diseases in plants causes losses over 1 billion dollars/year Some fungi are beneficial : drugs, baking yeast, cheese & wines

General knowledge of the fungi

- **Both sexual and asexual spore may be produced Store their food as glycogen (plant; starch) Fungi are heterotrophic organisms, lack of chlorophyll (plant; autotrophic)**



Yeasts

– **Spherical or oval**

Facultative Anaerobes, Fermentation : ethanol and CO_2 ,Non-filamentous unicellular fungi, Reproduction: a) by fission, or b). By budding

MOULD

- **Multicellular, mostly grow at 25-30 C**

Micr.: . Hypha(e) (dia: 2-10 µm)

. Spores / conidia

Macr : Cottony/ powdery/ Surface texture : wooly/velvety/granular/glabrous

Pigmentation : obverse & reverse

- **Yeast : unicellular, 37^{0}C**
  - **Budding Yeast – may produce a pseudohypa**
  - **Fission yeast**
- **Mold : multicellular, hyphae, 25^{0}C**
- **Dimorphic fungi (thermally dimorphic fungi) : mold phase & yeast phase**
- **Eukaryotic microorganisms with Rigid cell walls: chitin, glucans, mannans**
- **Plasma membranes: composed of ergosterol**

Lysine synthesis by L-α amino adipic acid (AAA) pathway while other organisms synthesize lysine by diaminopimelic acid (DAP) pathway.

COMPARISON OF FUNGI vs BACTERIA

PROPERTY	FUNGI	BACTERIA
Cell volume (μm^3)	Yeasts: 20-50 Molds: much greater variability	1-5
Nucleus	Eukaryotic, well-defined	Prokarvotic. no nucleus, no membrane
Cytoplasm	Cellular organelles	Little subcellular organization
Cell Wall	Glucans, mannan, chitin	Peptidoglycan, LPS (G-) teichoic acids (G+)
Cell Membrane	Ergosterol	Sterols, *Mycoplasma only* Mycolic acids, *Mycobacterium sp. only*
Sensitivity to Chemotherapeutics	Unaffected by penicillins, antibiotics; sensitive to polyenes & giseofulvin	Unaffected by polyenes & giseofulvin; all ~sensitive to antibiotics

Basic diagnostic techniques

KOH ,Culture and Woods light

- Tinea infections with special attention to scalp, feet and nails
- Tinea Versicolor
- Candidiasis
- Differentials to consider basic Treatment

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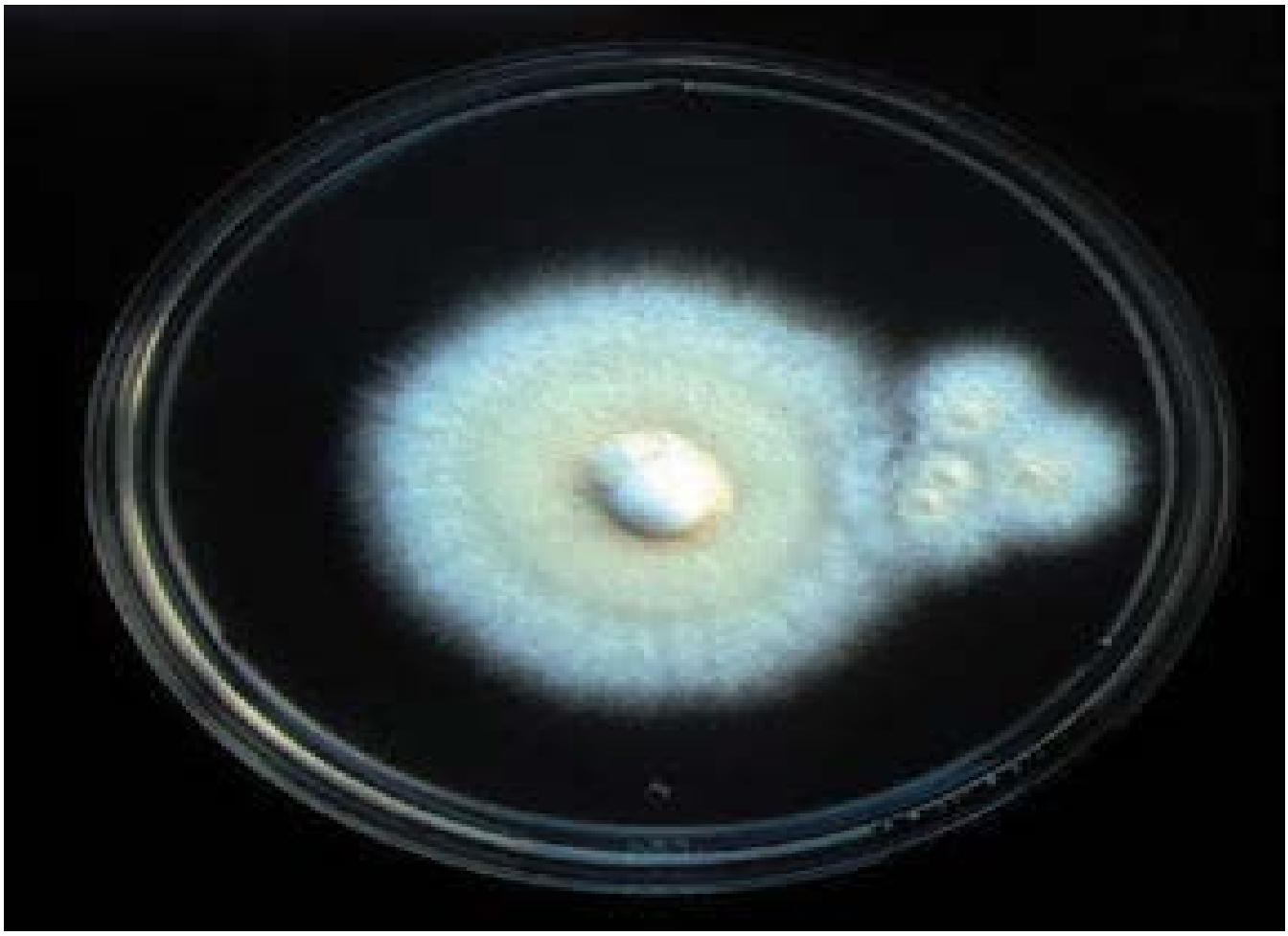


CLASSIFICATION OF FUNGI

Four groups of true fungi

- **Zygomycetes (common bread mold—*Rhizopus*)**
- **Basidiomycetes (puffballs & common mushrooms)**
- **Ascomycetes (Dutch elm disease/rye smut)**

-- Deuteromycetes (fungi imperfection)

- **First three groups is based on their method of sexual reproduction**
- **4th group, the Deuteromycetes, have NO sexual reproduction**

Morphological classification

a- Filamentous fungi (molds)

Grow as threads (hyphae)

Interlace to form mycelium

b-Yeasts:

single cells, reproduce by budding

separate : ***Cryptococcus neoformans***

attached : ***Candida albicans***

c- Dimorphic :

exist in two forms *(Histoplasma capsulatum)*

Yeasts (at 37 °C) Or Molds (at 27 °C)

Clinical classification

1- Superficial mycoses: *Tinea versicolor*

The infection is restricted to Keratin layer

2- Cutaneous mycosis: *Dermatophytes*

The fungi invade deeper but not dermis

3- Subcutenous mycosis:

Mycotic mycetoma, Chromomycosis, Sporotrichosis

4- Systemic mycosis:

Histoplasmosis, Blastomycosis

5-Opportunistic diseases:

Candidosis, Cryptococcosis, Aspergillosis

6-Toxic fungal diseases:

Aflatoxin of *Aspregillus flavus* grown on seeds

exotoxin formed in share between fungus and medium

Mycotismus: the fungal flesh is toxic(black mushroom)

7-Allergic fungal diseases:

Fungal spores are inhalant allergens

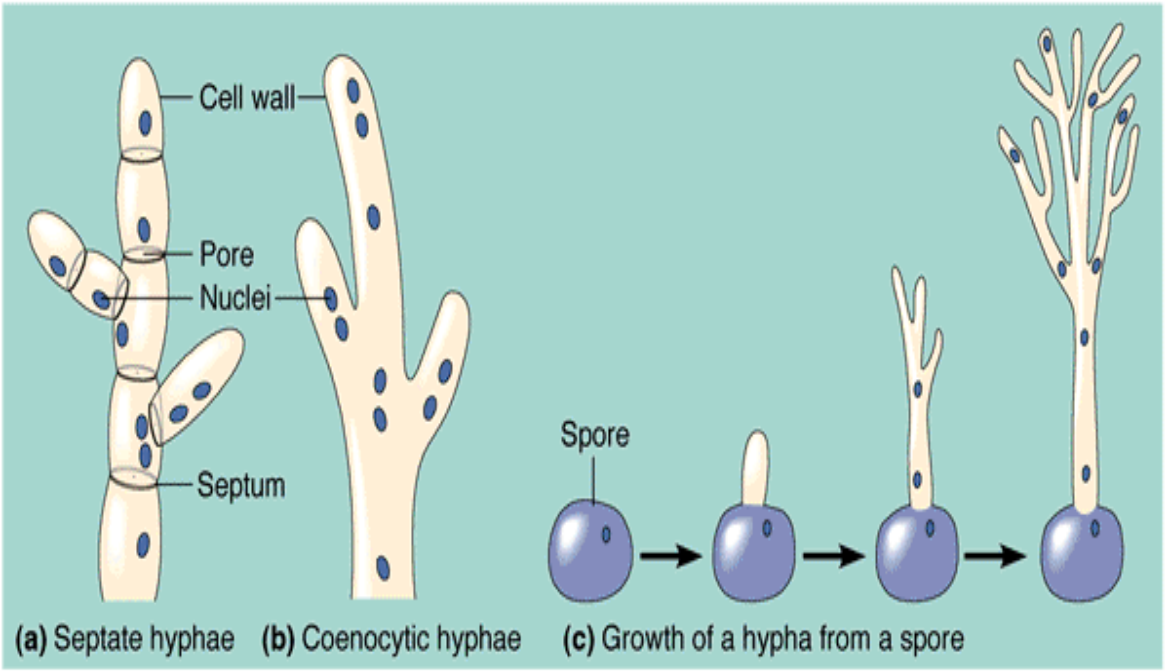
Aspregillus hay fever(type I) or farmer's lung(typeIII)

***** A single fungus can cause more than one clinical category

Fungal Structure

- Thallus-"body" Molds & fleshy fungi have these structures
  - Long filaments of cells (hyphae):
    - » Septate hyphae (cross wall) :most fungi
    - » Aseptate hyphae (coenocytic) :no cross wall, continous mass with many nuclei .
- Mycelium –

– Abundance growth of aerial hyphae resulting a mass can be observed with unaided ayes



- **Reproduction of Fungi : reproduce by**

1. Sexual reproduction --Sexual spores (very rare)

2. Asexual reproduction--Asexual spores(mostly) Simple elongation of the hyphae

*** Asexual reproduction Binary fission, Formation of thick-walled spores**

3. Parasexual reproduction--Genetic exchange* Some fungus multiply asexually by more than method