Introduction to Medical Mycology

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Intended Learning Outcomes

- Define terms associated with the study of fungi
- Describe the basic characteristics of fungi
- Demonstrate knowledge and understanding of the various classification of mycoses
- Differentiate between perfect fungi and fungi imperfectii Differentiate between Superficial, Cutaneous, Subcutaneous, Systemic, and Opportunistic

Introduction

myco = fungus

-logy = study

Introduction

- **mycology**
  - study of fungi
- **mycologists**
  - scientists who study fungi
- **mycotoxicology**
  - study of fungal toxins and their effects e.g; some species of mushroom.
- **mycoses** (Mycosis)
  - diseases caused by fungi

Characteristics of Fungi

→ Multicellular vs. bacteria (Unicellular)

- There are thousands species of fungi.
- Most of them are saprophytes. → live on dead/decaying organic matter.
- Few species cause disease in man. → Pathogenic / Non-pathogenic
- Fungi are eukaryotic organisms. vs. bacteria (Prokaryotic)
- Their cell wall consists primarily of chitin and their cell membrane contains ergosterol, in contrast to human cell membrane that contains cholesterol. vs. bacteria (Peptidoglycan, LPS & phospholipids)
- They can be classified morphologically or clinically:

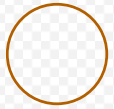
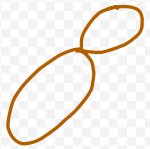
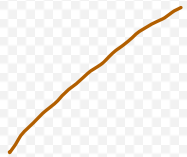
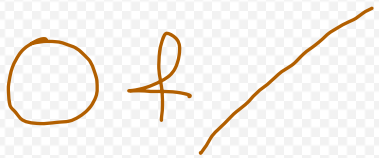
CLASSIFICATION

1. Morphological classification Shape

2. Clinical classification disease

A) Morphological Classification

Depending on **cell morphology**

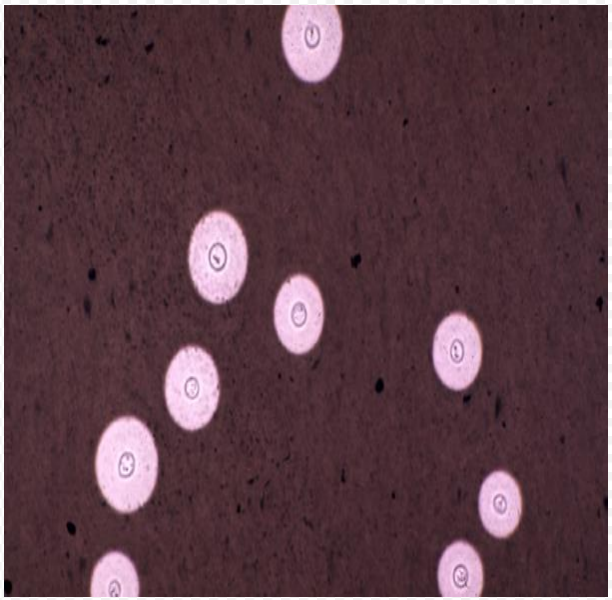
1. Yeasts  (one cell)
2. Yeast-like fungi  (pseudo-hyphi)
3. Filamentous (Molds) 
4. Dimorphic fungi 

Morphological Classification

Yeasts

- Unicellular fungi which reproduce by budding تبرعم
- On culture - produce smooth, creamy colonies

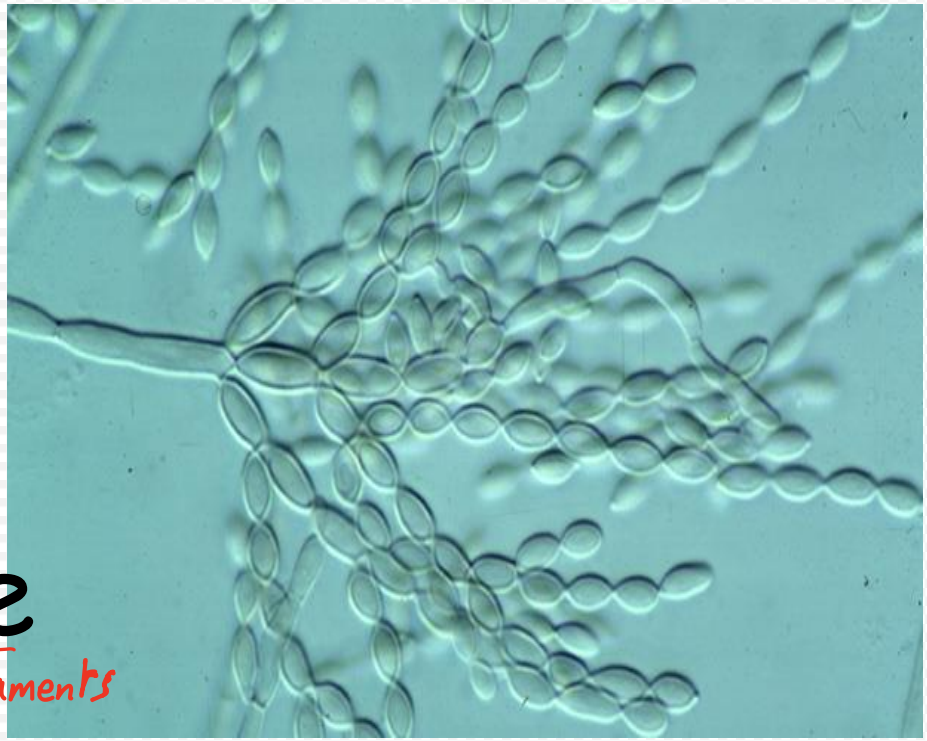
  e. g Cryptococcus neoformans حفظ + صوم
  (capsulated yeast)



Morphological Classification

Yeast like fungi

- Grow partly as yeasts and partly as elongated cells resembling hyphae which are called **pseudo hyphae**.
  e.g. Candida albicans → Most common cause of fungal infection.



↳ filaments

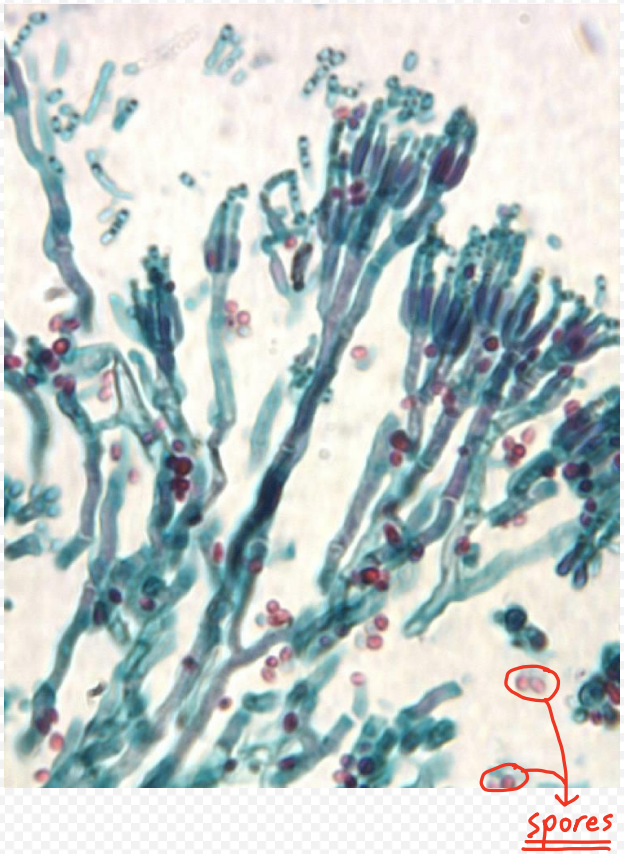
* During budding, there wasn't complete seperation of cells, just constriction between them.
↳ The cause of incomplete separation is lack of nutrients in surrounding enviroment

Morphological Classification

Filamentous/Molds fungi

- These are branching filaments (hyphae) which may be septate or non-septate. They reproduce by asexual spores, which may be unicellular or multicellular
- e.g. Dermatophytes (Epidermophyton and Trichophyton and) and Aspergillus.

Multicellular
Unicellular
Not budding
skin



Morphological Classification

Dimorphic fungi

Mold in the cold
Yeast in the heat.

- Occur in 2 forms
  - Filamentous(Molds) – 25°C (soil)
  - Yeasts – 37°C (in host tissue)

Most fungi causing systemic infections are dimorphic:

- *Histoplasma capsulatum*
- *Blastomyces dermatidis*
- *Coccidioides immitis*

B) Clinical Classification

↳ less important than Morphological classification

- Superficial سطحي
- Cutaneous نفس الجلد
- Subcutaneous تحت الجلد
- Systemic كل الجسم
- Opportunistic انتهازي

Superficial Mycosis

. These are fungal infections that are confined to the stratum corneum without tissue invasion

e.g.

pityriasis versicolor or tinea versicolor caused by Malassezia furfur.

Cutaneous Mycosis

- Affect epidermis of skin, hair and nail
  - ↳ Keratinized tissue
- Caused by Dermatophytes (*Epidermophyton, Trichophyton*)
- Dermatophytes - secrete keratinase
- Spread peripherally from foci to produce ring-like lesions hence called ringworm
- Person to person, animal to person
- Direct contact from infected hair, skin
- Tinea capitis (scalp, hair),
- Tinea pedis (athlete's foot)

(a) Tinea Capitis

(b) Tinea Corporis

(c) Tinea Pedis

Figure 9.5:
Clinical conditions of Dermatophytes

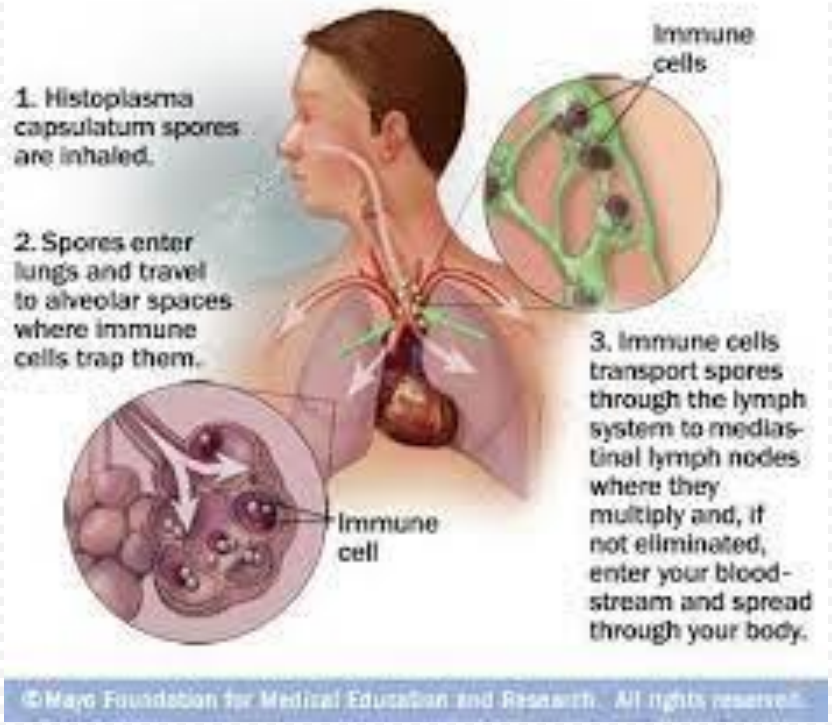
Subcutaneous Mycosis(Mycetoma) = Madura foot

Very hard to treat

- Mycetoma is a chronic granulomatous infection that usually involves the lower limbs.
- Common in tropical areas in bare footed persons.
- Infection not contagious
- Fungal mycetoma caused by a heterogeneous group of species having true septate hyphae e.g. Madurella mycetomatis

Systemic Mycosis

- Deep, involve tissues and organs
- Saprophytic fungi, live in soil as filamentous
- Inhalation of spores of Dimorphic fungi
- Within the lungs, the spores differentiate into yeasts and may spreads other tissues especially in immune suppressed patients



Systemic Mycosis

- Often resemble tuberculosis
- Not contagious
- e.g.
- Blastomycosis
- Coccidioidomycosis
- *Histoplasmosis*

Opportunistic Mycoses

- Harmless in normal habitat (includes normal flora), pathogenic in debilitated host
- E.g.
- Candidiasis - caused by *Candida albicans*
  - Vulvovaginal following antibiotic therapy
  - Oral thrush including mouth and throat
- Cryptpcoccosis-caused by *Cryptococcus neoformans*

Milky discharge

Thank You