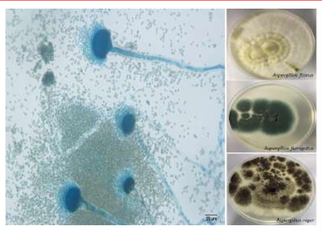
A TO Z BENCH TO BEDSIDE IN MEDICAL MYCOLOGY

มหาวิทยาลัยมหิดล
คณะเวชศาสตร์เขตร้อน

A *Aspergillus* species



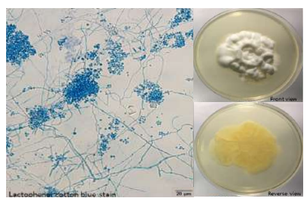
Phylum [Division]: Ascomycota [Sac fungi]

Clinicomycological importances :

- **Direct causes:**
  Subcutaneous mycoses [Hyalohyphomycosis], and Opportunistic fungal infections
- **Indirect causes:**
  Fungal allergy and Mycotoxicosis [Species dependent]

Transmission route: Penetration [Direct trauma], Inhalation

B *Beauveria bassiana*

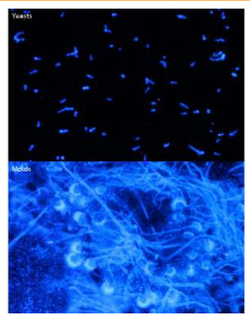


Phylum [Division]: Ascomycota [Sac fungi]

Clinicomycological importances :

- Entomopathogenic fungi for vector control such as mosquito vectors
- No evidence on the human health effects

C *Calcofluor* white stain



Clinicomycological importances :

- Fungal cell wall stain
- A fluorochrome that binds to chitin and cellulose presented in the fungal cell wall, is now commonly used to provide better delineation of fungal elements.

D Dermatophytosis

[An infection of the hair, skin, or nails caused by a dermatophyte(s)]

Phylum [Division]: Dermatophytes are members of the Ascomycota [Sac fungi]

Clinicomycological importances :

- **Direct causes:**
  Cutaneous mycoses [Tinea or Ringworm infection]

Transmission route : Contact with contaminated objects and animal's skin or hair

E *Exophiala* species

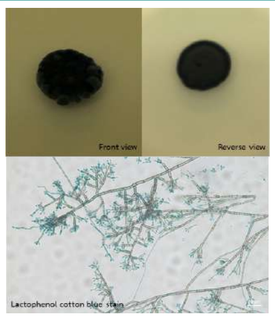
Phylum [Division]: Ascomycota [Sac fungi]

Clinicomycological importances :

- **Direct causes:**
  Subcutaneous mycoses [Phaeohyphomycosis], and Opportunistic fungal infections

Transmission route : Penetration [Direct trauma]

F *Fonsecaea* species



Phylum [Division]: Ascomycota [Sac fungi]

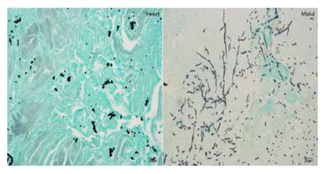
Clinicomycological importances :

- **Direct causes:**
  Subcutaneous mycoses [Chromoblastomycosis], and Opportunistic fungal infections

Transmission route: Penetration [Direct trauma]

G Gömöri Methenamine Silver

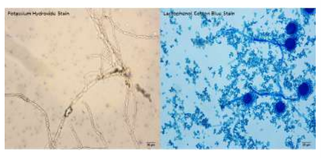
[Grocott-Gomori's methenamine silver: GMS stain]



Clinicomycological importances :

- Particularly useful in staining carbohydrates
- It is used widely as a histopathological screening assay for fungal organisms.
- Fungal cell walls are outlined by the brown to black color produced by the reduction of silver ions.

H Hyaline molds



Clinicomycological importances :

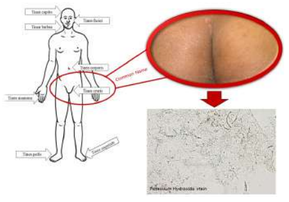
- Filamentous form with colorless hyphae when stained with Potassium Hydroxide [KOH] and presented in Blue color after stained with Lactophenol cotton blue [LPCB] such as *Aspergillus, Beauveria, Penicillium* spp., etc.
- On the contrary, Dematiaceous molds appear as dark brown hyphae after KOH and LPCB staining.

I India ink test

Clinicomycological importances :

- India ink stain is a common bedside diagnostic tool for *Cryptococcus neoformans.*
- This staining dye used for visualization of fungal capsule in Cerebrospinal fluid (CSF). The particles of ink pigment can not enter the capsule leading to a zone of clearance or "halo" around the cell.

J Jock itch



Synonym : Tinea cruris is a specific form of ringworm infection caused by dermatophyte fungus affecting the groin, pubic region, adjacent thigh, and perianal areas.

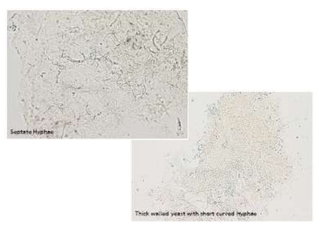
Clinicomycological importances :

- **Pathogenic causes :**
  Dermatophytes, the most common are *Trichophyton rubrum* and *Epidermophyton floccosum.*
- **Direct causes :** Cutaneous mycoses [Dermatophytosis or Ringworm infection]

Transmission route : Contact with contaminated objects

K KOH preparation

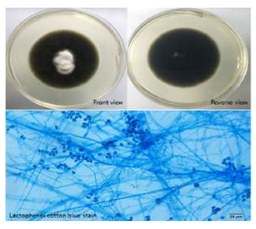
[Potassium hydroxide stain]



Clinicomycological importances :

- A simple, rapid, non-invasive and accurate medical procedure for diagnosing fungal infections of the skin or nails
- Evaluation is done under a microscope to look for specific characters of the fungus such as Yeast or Mold, Pigmented or Colorless, Septate or Non-septate fungus.

L *Lomentospora prolificans*



Phylum [Division] : Ascomycota [Sac fungi]

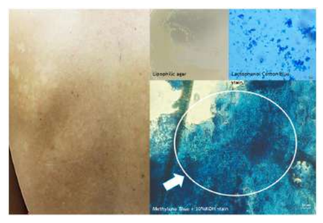
Clinicomycological importances :

- **Direct causes:**
  Subcutaneous mycoses [White/Pale grains Eumycetoma], Opportunistic fungal infections [Scedosporiosis]

Transmission route: Penetration [Direct trauma], Aspiration

M *Malassezia* species

[Lipophilic yeasts]



Phylum [Division] : Ascomycota [Sac fungi]

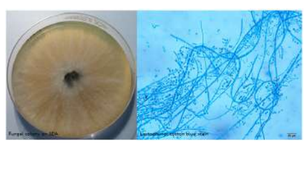
Clinicomycological importances :

- **Direct causes :**
  Superficial mycoses [Pityriasis versicolor]

Transmission route : Non-specific, more closely related to poor personal hygiene and/or abnormally excessive sweating [Hyperhidrosis]

N *Neoscytalidium* species

[Previously known as *Scytalidium* species]



Phylum [Division] : Ascomycota [Sac fungi]

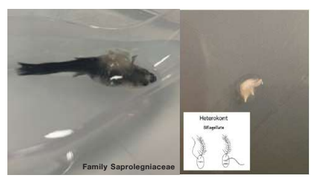
Clinicomycological importances :

- **Direct causes :**
  Onychomycosis [Cutaneous mycoses and Opportunistic fungal infection]

Transmission route : Penetration [Direct trauma], Contact with contaminated objects

O Oomycetes

[*Saprolegnia* spp.]

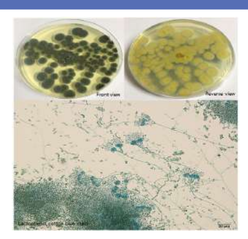


Phylum [Division] : Oomycota [Fungus-like organisms in the kingdom Chromista]

Clinicomycological importances :

- No human health concern [Non-human pathogenic fungus]
- An infection is known as oomycosis.
- According to Saprolegniasis, it referred to a cutaneous infection by a variety of watermolds (Oomycetes, Diplomastigomycotine; genera include *Achyla*, *Saprolegnia*, and others).

P *Penicillium* species



Phylum [Division] : Ascomycota [Sac fungi]

Clinicomycological importances :

- **Direct causes :**
  Subcutaneous mycoses [Hyalohyphomycosis], Opportunistic fungal infections [Penicilliosis]
- **Indirect causes :**
  Fungal allergy and Mycotoxicosis (Species dependent)

Transmission route: Penetration [Direct trauma], Inhalation

Q *Quadrivirus*

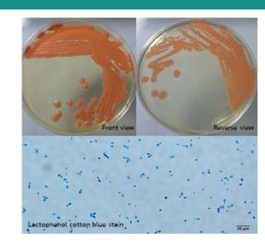
[Mycovirus that classified into *Quadriviridae* family]

Clinicomycological importances :

- Non-enveloped spherical viruses with quadripartite double-stranded RNA genomes
- Reduced Virulence of the Aspergillus fumigatus, but does not cause disease in humans

Transmission route: Transmitted by hyphal anastomosis [Horizontal transmission], and during sporogenesis [Vertical transmission] also known as internal transmission

R *Rhodotorula* species



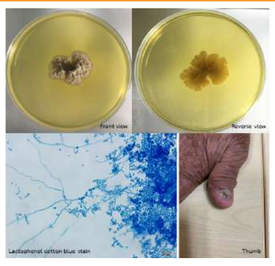
Phylum [Division] : Basidiomycota [mushrooms, puffballs, stinkhorns, bracket fungi]

Clinicomycological importances :

- **Direct causes :**
  Opportunistic fungal infections [Fungemia]
- Commonly used in wine fermentations, astaxanthin production, etc.

Transmission route : Penetration [Direct trauma]

S *Scopulariopsis* species



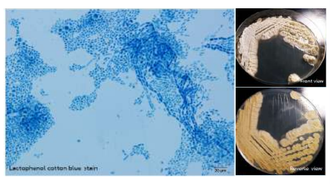
Phylum [Division] : Ascomycota [Sac fungi]

Clinicomycological importances :

- **Direct causes :**
  Onychomycosis [Cutaneous mycoses and Opportunistic fungal infection]

Transmission route : Penetration [Direct trauma], Contact with contaminated objects

T *Trichosporon asahii*



Phylum [Division] : Basidiomycota [mushrooms, puffballs, stinkhorns, bracket fungi]

Clinicomycological importances :

- **Direct causes :**
  Superficial mycoses [White piedra]

Transmission route : Non-specific, more closely related to poor personal hygiene

U Vegetative hyphae

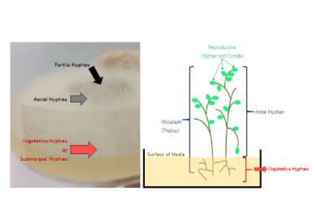
[Submerged hyphae]

Clinicomycological importances :

- Rapid and significant screening to differentiate *Trichophyton* species
- Positive result: Changes from light orange to magenta
  - *Trichophyton mentagrophytes* and *Trichophyton tonsurans*
  - *Cryptococcus* spp, *Corynebacterium* spp, *Helicobacter pylori*, *Yersinia* spp, *Proteus* spp,*Brucella* spp, etc.
- Negative result: Remain light orange [medium retains original color]
  - *Trichophyton rubrum*, *Escherichia* spp., *Shigella* spp., *Salmonella* spp., etc.

V Vegetative hyphae

[Submerged hyphae]



Clinicomycological importances :

- Hypha/ Hyphae consists of one or more cells surrounded by a tubular cell wall
- Classification based on growth location
  - **Vegetative or Submerged hyphae :** Penetrate across food sources
  - **Aerial hyphae :** Produce asexual reproductive spores

W Wood lamp test

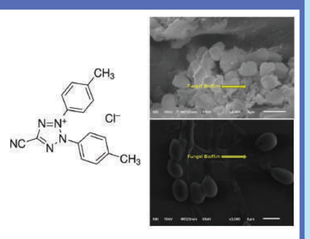
[Black light or ultraviolet light test]

Clinicomycological importances :

- The chemical responsible for positive fluorescence is a Pteridine
- Particularly useful in the diagnosis of tinea capitis
- Positive results:
  - Bright-green color: *Microsporum audouinii, M. canis, etc.*
  - Faint blue color: *Trichophyton schoenleinii*
  - Yellowish-white or copper-orange: *Malassezia furfur*
- Negative results: *Trichophyton tonsurans, T. verrucosum*

X XTT assay

[The second generation tetrazolium dye]



[2,3-bis (2-methoxy-4-nitro-5-sulfophenyl)-5-[(phenylamino)carbonyl]-2H-tetrazolium hydroxide]

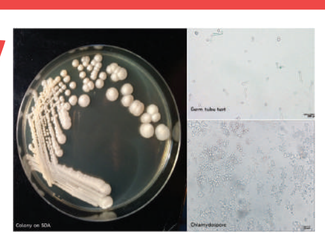
- Colorimetric assay is based on the reduction of a yellow tetrazolium salt to an orange formazan dye by metabolically active cells

Clinicomycological importances :

- Commonly used in studies of the fungal biofilm development, drug resistance, yeast viability, cell proliferation, cytotoxicity, and apoptosis assays

Y Yeast infection

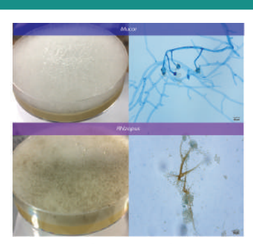
[*Candida albicans*]



Clinicomycological importances :

- The simplest morphological classification of a fungus is unicellular budding cell [Yeast] and multicellular filamentous fungi [Mold]
  - Molds such as Dermatophytes, *Aspergillus* spp., *Penicillium* spp., etc.
  - Yeast such as *Candida* spp., *Cryptococcus* spp., *Saccharomyces* spp., etc.

Z Zygomycetes



Phylum [Division] : Zygomycota [Pin molds]

Clinicomycological importances :

- **Direct causes :**
  Subcutaneous mycoses [Zygomycosis] and Opportunistic fungal infections

Transmission route : Penetration [Direct trauma]

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