

## Mycology

***Fungi*** are Eukaryotic cells , which lack chlorophyll, so they cannot generate energy through photosynthesis. About 100 Fungi types are opportunistic pathogens. They are larger in size than the Bacteria and they are classified into 2 major groups:

### **1. Yeast**

Yeast is considered as a part of the normal flora. It can be found in the Oral cavity, intestine, and Vagina. In addition, it is also a Unicellular organism (0.5-4 um), reproduces by budding (asexually) although a few types reproduce by binary fission.

\****Pathogenic Yeasts*** produce often elongated Oval cell and Pseudohyphae on body mucosal cells.

-Note: Yeast is ***not susceptible*** to antibacterial drugs , phages

### **2. Molds(filamentous Fungi)**

Multicellular organisms (cells up to 20um) , composed of clumps of intertwined branching Hyphae(Septate/non-septate Hyphae). They can grow by longitudinal extension or by producing spores. In molds, the mycelia often spread to fill the available space, limited by available nutrients.

Notes:

-Masses of Hyphae are called ***mycelium***.

-***Pathogenic Mold***: single and multiply filaments.

Fungi are essentially aerobic organisms, mostly found in Nature living in association with plants. They have chemoheterotrophic metabolisms, obtaining nutrients through chemical absorption.

Notes:

-***Saprophytes*** are Fungi that live in and utilize the dead organic substances as an energy source.

-***Dimorphic Fungi***: Fungi that can grow as either a yeast or mold , depending on the environmental conditions and temperature(As Yeasts or Yeast-like structure in vivo at 37°C, but as Molds at 25°C)

***Antifungal drugs***: Nystatin, Fluconazol, Amphotericin B, Casbofungin. All of them react with ergosterol forming complex molecules, damaging the cell membrane.

### **Fungi cell structures**

-***Fungi cell wall*** : Mostly Polysaccharides (chitin, glucan, mannan), lipid-phosphate-protein, protease, melanin .

-***Plasma membrane*** : Their Plasma membranes containing sterols (Ergosterol , the essential sterol in fungi rather than cholesterol in humans).Cytoplasm of fungus contains microtubules composed of tubulin. It also contains Mitochondria, Lipids, and phosphate granules.

### Lab Identification :

- It is relay on the morphological features NOT like bacteria which relay on the the biochemical and serological tests.
- Culture on Sabourauds dextrose agar/ blood agar medium
- Slow or rapid growth (2-30 days) , then we can see the morphological features, colores, sizes/numbers of spores, Hyphae (septated/non-septated , branching/non-branching) ... etc

### Dermatophytosis /Superficial Mycoses/ Cutaneous Mycoses:

- Dermatophytic fungi live in the dead , horny layer of the skin , hair , and nails (they digest the Keratin existing there).
- The common Dermatophytes are : Trichophyton , Microsporium ,and Epidermophyton species
- Yeast can cause a type of superficial fungus infections called Tinea versicolor = Pityriasis versicolor.

**Tinea versicolor** (Versicolor= Multicolored) : leads to hypopigmented or hyperpigmented patches on the skin, Caused by Malassezia Furfur.

**Clinical Features:** Erythematic Skin lesions, Rare inflammation, Allergic reaction, Common under stress conditions,Fever.

- The yeasts can often be seen under the microscope within the lesions with typically round yeasts & filaments. It's Difficult to culture.

**Hair** : Tinea capitis , infect hair follicles and scalp , Primarily occurs in children and it's rare in adults.

**Nail:** Tinea unguium &Tinea pedis . In Tinea unguium , nails are thickened and brittle. Tinea pedis infection occurs between the toes (fingers) causing peeling of the skin. This infection requires warm and moisture to occur (commonly in adults wearing shoes).

### Encapsulated Cryptococcus Neoformans :

C.Neoformans contains Large **polysaccharide capsule** . C.Neoformans can also cause a chronic- subacute- acute pulmonary infection. After inhalation and causing local lung infection , it may spread to blood then to CNS where it causes meningitis. Most Cases occur in immunocompromised patients. In addition , 10% of AIDS patients develop cryptococcosis.

Note : This fungus is found in pigeon droppings

### Aspergillus

- Aspergillus species (A. fumigatus, A. flavus, A. niger)
- Aspergillus Spores spread with dust particles
- Inhalation of these spores can cause "Allergic bronchopulmonary aspergillosis- ABPA"
- Some persons can develop an asthma-type reactions to these spores. They have type 1 hypersensitivity reactions with **blood eosinophilia**..
- Aspergillus can also cause Pulmonary lesions in pre-formed cavities (Aspergilloma)

Aspergilloma : in debilitated tissues , Common in Tuberculosis & Lung carcinoma (due to cavities formed by these diseases)

-Aspegilloma requires surgical removal or anti-fungal agents.

-Mycotoxins are toxins produced by Fungi . The toxin produced by Aspergillus is called aflatoxin (released by A. flavus species) . This toxin causes Liver cirrhosis, Liver cancer and finally leads to death.

Ingestion of foods contaminated with these toxins ( such as Peanuts, grains , and rice) may lead to Mycotoxicosis.