

# **General biology 2**

## **2<sup>nd</sup> stage**

### **Medically Important Fungi**

**By**

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## Medically Important Fungi

Fungi : are eukaryotic and nonphotosynthetic , which are the great practical and ecological importance ; they include mushrooms , puffballs

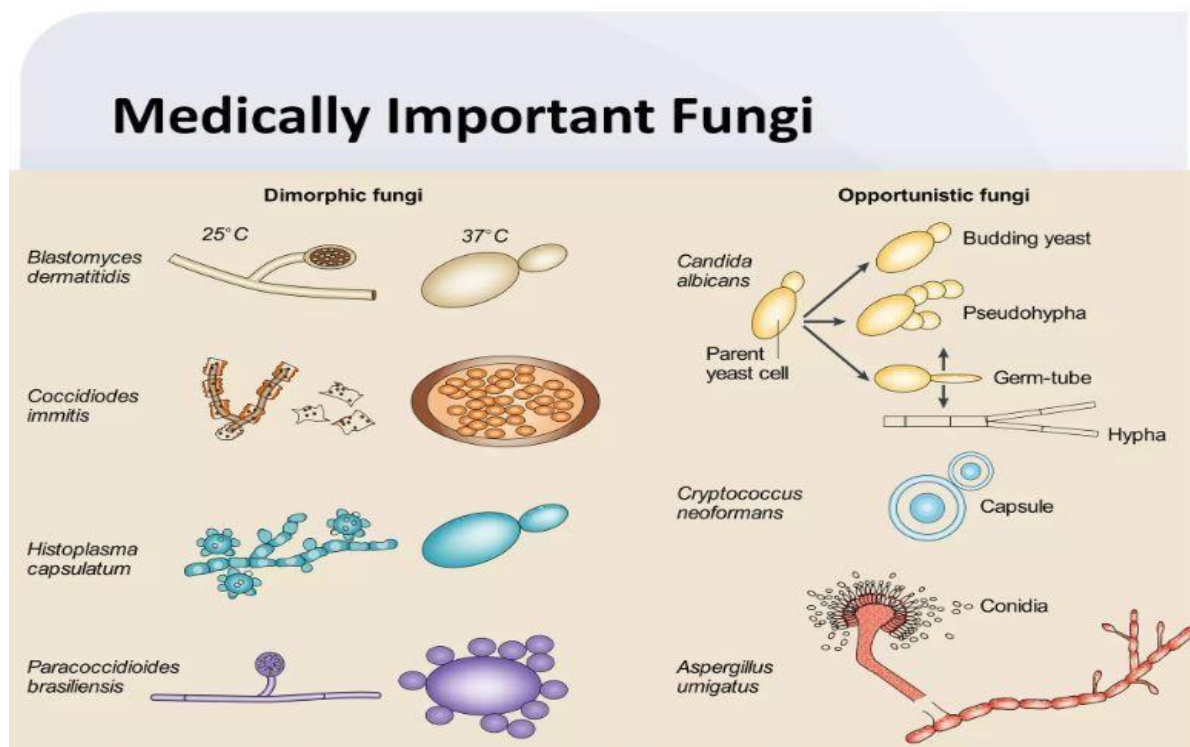
,woody bracket fungi , molds and yeasts.

- Structure and function : fungi differ from bacteria in size , ceullar organization , and methods of reproduction fungus is a general term that includes two different forms . a- molds b- yeasts cdimorphic (two form)

A- Molds : structural unit is the hypha , filaments of hyphae can be subdivided into multicellular forms by cross walls , or septa , mold growth resulting in cobweblike aggregation of hyphae is called mycelium , spores are the specialized reproductive cells of molds

B- Yeasts : oval to spherical cells that form moist shining colonies , some yeasts may produce capsules . Reproduce asexually by producing new buds.

C- Dimorphism : Under certain environmental conditions some fungi exhibit two different forms , appearing as either molds or yeasts .This phenomenon is called dimorphism (e.g: Blastomyces Histoplasma)



## Reproduction and spores:

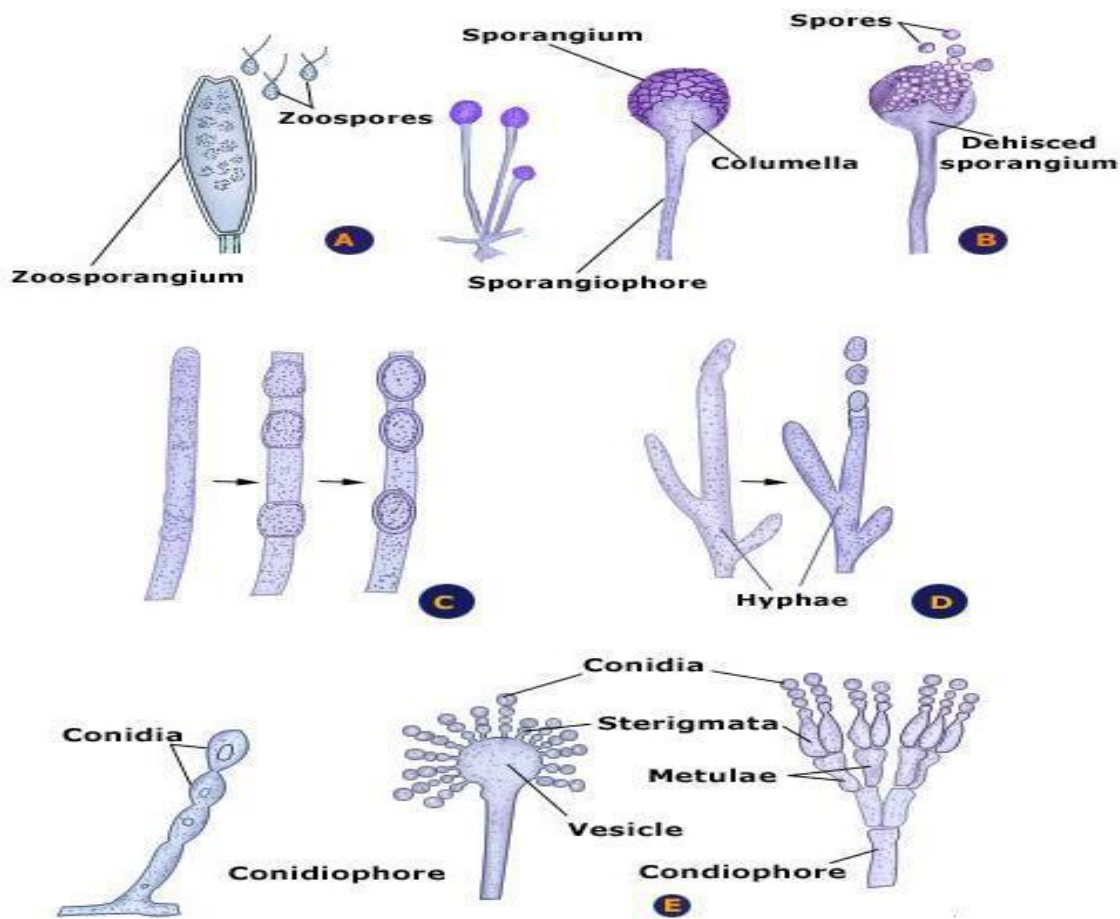
Type of spore & sporulation — process are both important to fungal identification & classification . Fungi spores function as reproductive cells spores are generated either asexually or sexually.

1- Asexual spores • include arthrospores blastospores chlamydospores , conidia

, sporangiospores , and zoospores.

Under appropriate conditions of nutrition , moisture , pH and temperature , fungal spores germinate and produce one or more long structure called germ tubes . Germ tubes subsequently develop into hyphae.

2- Sexual spores : include ascospores , basidiospores , oospores and zygosporangia.



### Ultrastructure of fungi:

Cellular membranes contain sterols , a property that separates fungi from procaryotes . The cell — walls of filamentous fungi are composed of thin , threadlike structures called microfibrils ( which are composed of chitin ) and cellulose . Yeast cell — walls contain the polysaccharides glucan and mannan , aswellas lipids , and amino suger glucosamine.

Pili appear on the cell walls of various yeasts . These structure are similar to those of bacteria and may involved with sexual reproduction of yeasts.

- **Cultivation of fungi** : molds & yeasts can be grown & studied by cultural methods similar to those used for many bacteria . Media used for fungus cultivation are modified to limit the growth of other microbes Ingredients used for this purpose include antibiotics , dyes , high concentrations of sugars , and compounds that lower pH of media. Types of media : three basic types of media are used a- Natural (carrotplugs , potato slices.

- b- Dehydrated (Sabouraud dextrose agar(

- c- Synthetic

- **Classification** : several properties of fungi are used in fungus classification . These include:

- a- Methods of reproduction

- b- Mycelial formation

- c- Cellular structure and formation.

Five fungal classes are recognized on the basis of their method of reproduction:

Ascomycetes Basidiomycetes Deuteromycetes (fungi imperfecti) ,

Oomycetes

and zygomycetes.

### Classification of mycotic infections.

It is customary & useful to group the fungal diseases , or mycoses according to the tissues and organs affected and the disease pattern

## 1- Cutaneous ( superficial ) mycoses.

Also called dermatophytoses , these common dermatophytes . Dermatophytes fall in to three genera : Trichophyton Epidermophyton , and microsporum.

Fungi that attack mainly the epidermis , hair , nails , and mucosal surfaces called superficial fungi.

The disease caused by such agents include the various forms of Ring worm or Tinea (from the Latin meaning "growing moth" ) and Candida infections of mucosal surfaces , such as thrust and vulvovaginitis.

Superficial mycoses are further classified on the basis of the location of the effects produced by the causative fungi . e.g: Ring worm of the scalp is Tinea capitis.

Ring worm of the feet is Tinea pedis.

Clinical significance : characterized by itching , scaling skin patches that become inflamed & weeping.

**2- Subcutaneous mycoses :** are fungal infections of the dermis , subcutaneous tissue , and bone.

These infections acquired through traumatic lacerations or puncture wounds . for example

a- Sporotrichosis the infection characterized by a granulomatous ulcer at the puncture site , may produce secondary lesions along the draining lymphatics . The causative organisms sporothrix schenckii.

b- Mycetoma (Madura foot ) : appears as a localized abscess , usually on the feet . Abscess discharges pus , serum , and blood through sinuses . most common fungi are Madurella grisea.

**3- Systemic mycoses :** infections in which the causative agent invade the subepithelial tissues are known as deep — seated , deep , or systemic mycoses.

Entry into the host is by inhalation or airborne spores germinate in the lungs , dissemination can occur to any organ of the body leads to destroy tissue.

a- Coccidioidomycosis : caused by immitis . Lung of patient with acute coccidioid pneumonia possible sites of infection are central nervous system & bone.

b- Histoplasmosis caused by *Histoplasma capsulatum*  
pulmonary infections may be acute , chronic , progressive & fatal .  
possible sites of infection are skin , bone genitourinary trac.

#### **4- Opportunistic mycoses:**

Some fungi are opportunistic pathogens . They are not normally pathogenic to healthy persons , but under certain conditions , they can produce severe infections . Among these opportunistic agents are:

*Aspergillus* , *Candida* , *Cryptococcus*, *mucor* and *Rhizopus*.

Predisposing factors to opportunistic infection are : chronic , anemia , metabolic disorders , and intensive treatment with broad — spectrum antibiotics and drugs that suppress antibody formation.

a- Candidiasis (Thrush ) : is caused by *Candida albicans* , are normal body flora found in skin , mouth vagina & intestine. Both oral & vaginal infections are treated topically with nystatin or clotrimazole.

b- Cryptococcosis : is caused by *Cryptococcus neoformans* . the organism has a characteristic polysaccharide capsule that surrounds the budding yeast cell . A positive capsular stain on CSF can give a quick diagnosis of cryptococcal meningitis . the most common form of cryptococcosis is a mild , subclinical lung infection In immunocompromised patients the infection often disseminates to the brain & meninges , with fatal consequences The antifungal drugs used are amphotericin B and flucytosine.

c- Aspergillosis is caused by several species of the genus *Aspergillus* but primarily by *A. fumigatus* . The most severe &

often fatal form of aspergillosis is acute invasive infection of the lung . from which the infection can be disseminated to the brain , GI tract , and other organs . A less severe , noninvasive lung infection give rise to fungus ball (aspergilloma)

Although the lung is the most common primary site of infection , eye , ear , nasal sinuses , and skin can also be primary sites.

*Aspergillus* hyphae characteristically form V-shaped branches (septate hyphae that branch at 45 — degree angle ( .

Treatment of *Aspergillus* infections is typically by Amphotericin B and surgical removal of fungal masses or infected tissue.