



**General biology 2**

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

## **Medically Important Fungi**

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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.

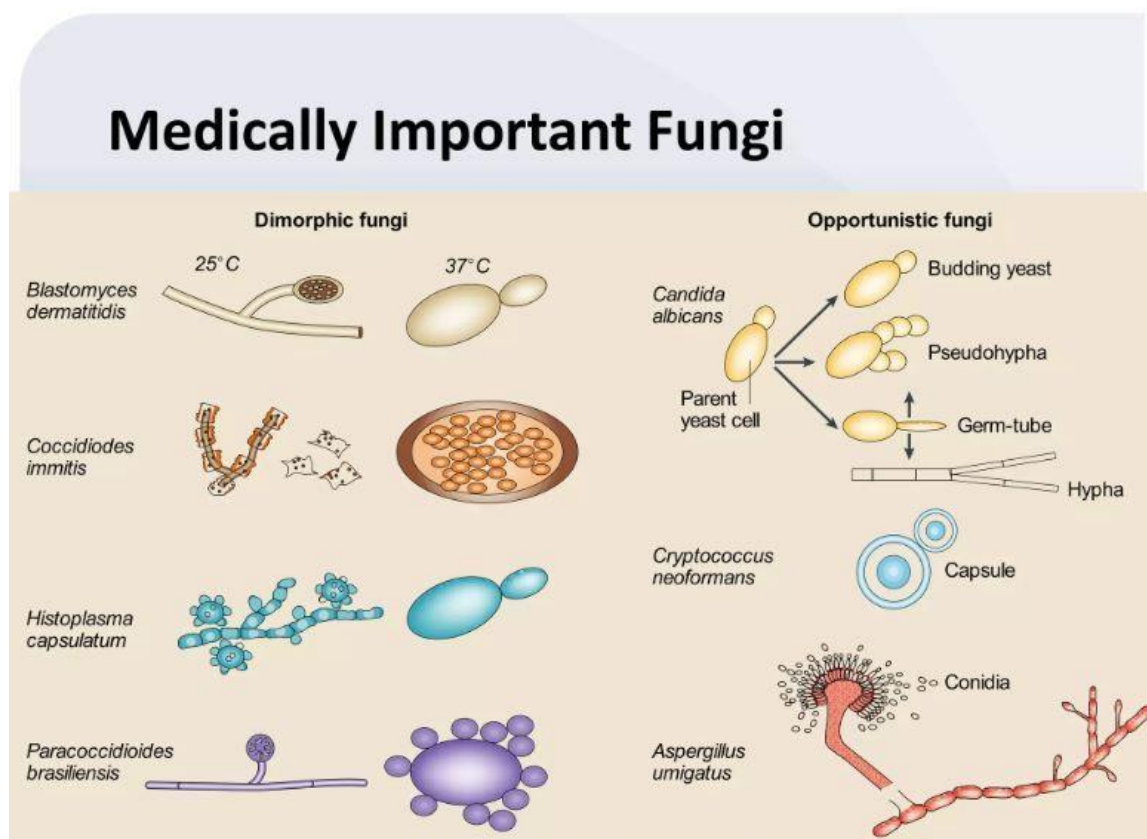
- Structure and function : fungi differ from bacteria in size , ceullar organization , and methods of reproduction fungus is a general term that includes two different forms . a- molds b- yeasts cdimorphic (two form(

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)



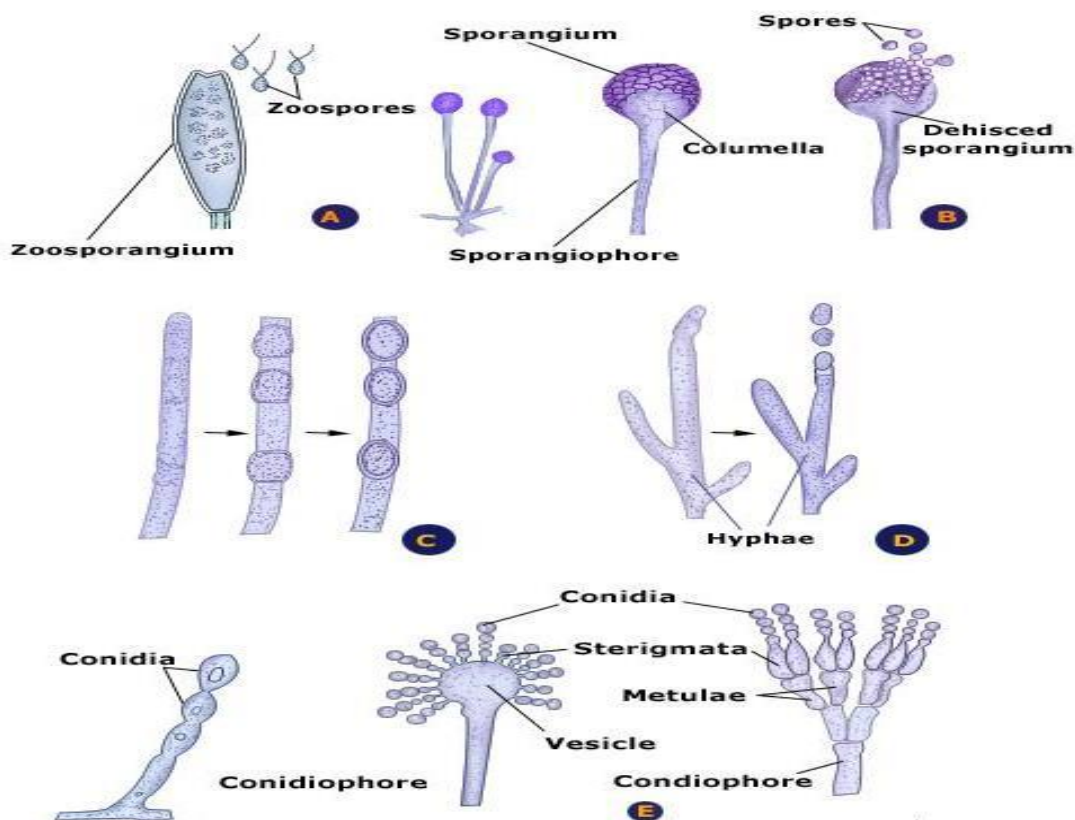
• **Reproduction and spores:**

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 chlamydo spores , 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 zygospores.



**Reproduction of fungi**

- **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 fungus . 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 coccidioidal 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 Cr\_yptococcus 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 . form 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.