

Introduction to Mycology

General Microbiology
2nd year student
2025-2026

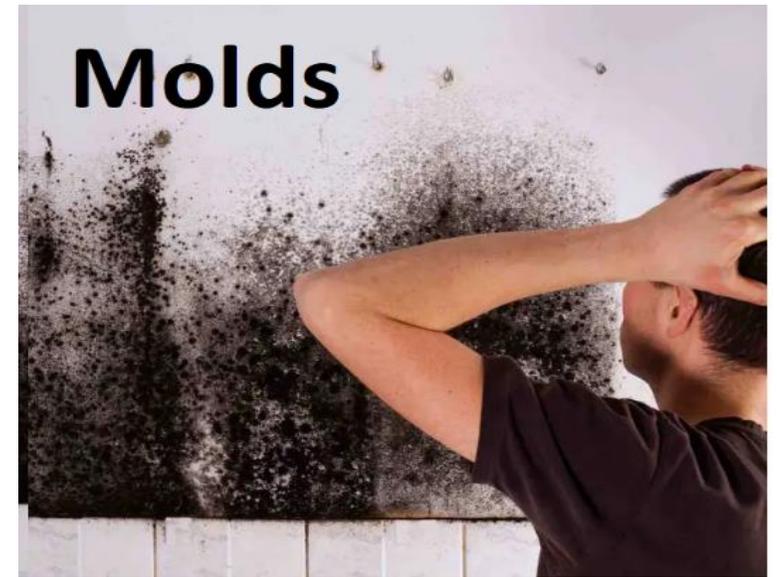
Dr. Mohammad Odaibat

Learning Objectives

- Demonstrate understanding of mycology and fungal morphology.
- Classification of fungi.
- Differentiate between nonsystemic fungal infections and deep fungal infections.

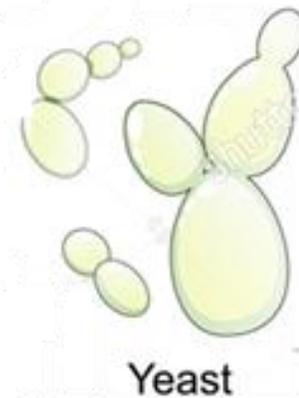
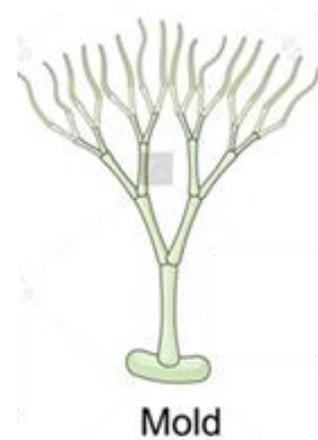
Introduction

- Fungi are eukaryotic organisms.
- Mykos means mushroom.
- Mycology is the study of fungi.
- Fungi are of three types (molds, yeasts, and mushrooms).



Fungi: Respiration and Nutrition

- Most fungi are obligate aerobes or facultative anaerobes.
- They are heterotrophs
- They feed by releasing digestive enzymes to the external environment to facilitate the uptake of nutrients



Classification of fungi



Morphological Classification

- Molds
- Yeast
- Mushroom

Classification based on the site of infection

- Superficial mycoses
- Cutaneous mycoses
- Subcutaneous mycoses
- Systemic infections
- Opportunistic mycoses

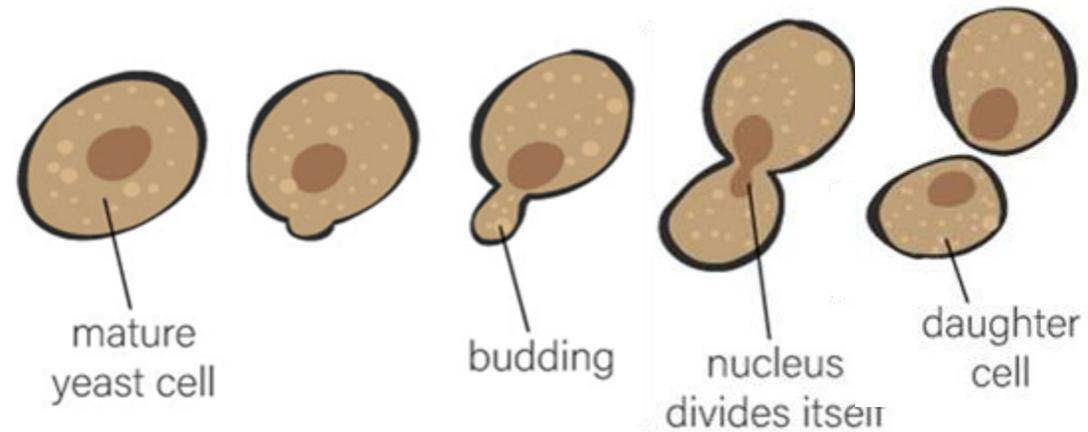
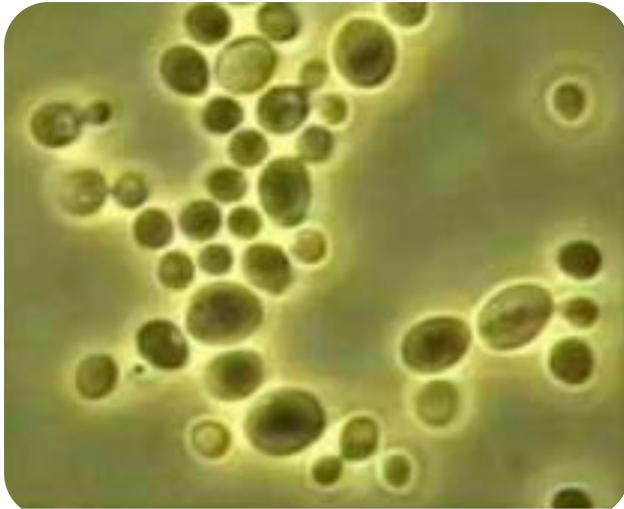
Fungi: Morphological Classification

1. Yeasts:

- Round or oval unicellular fungi that reproduce by asexual budding.
- On culture medium, such as Sabouraud dextrose agar (SDA), they produce creamy mucoid colonies.
- Example: *Cryptococcus neoformans* & *Candida albicans*



Candida albicans in SDA

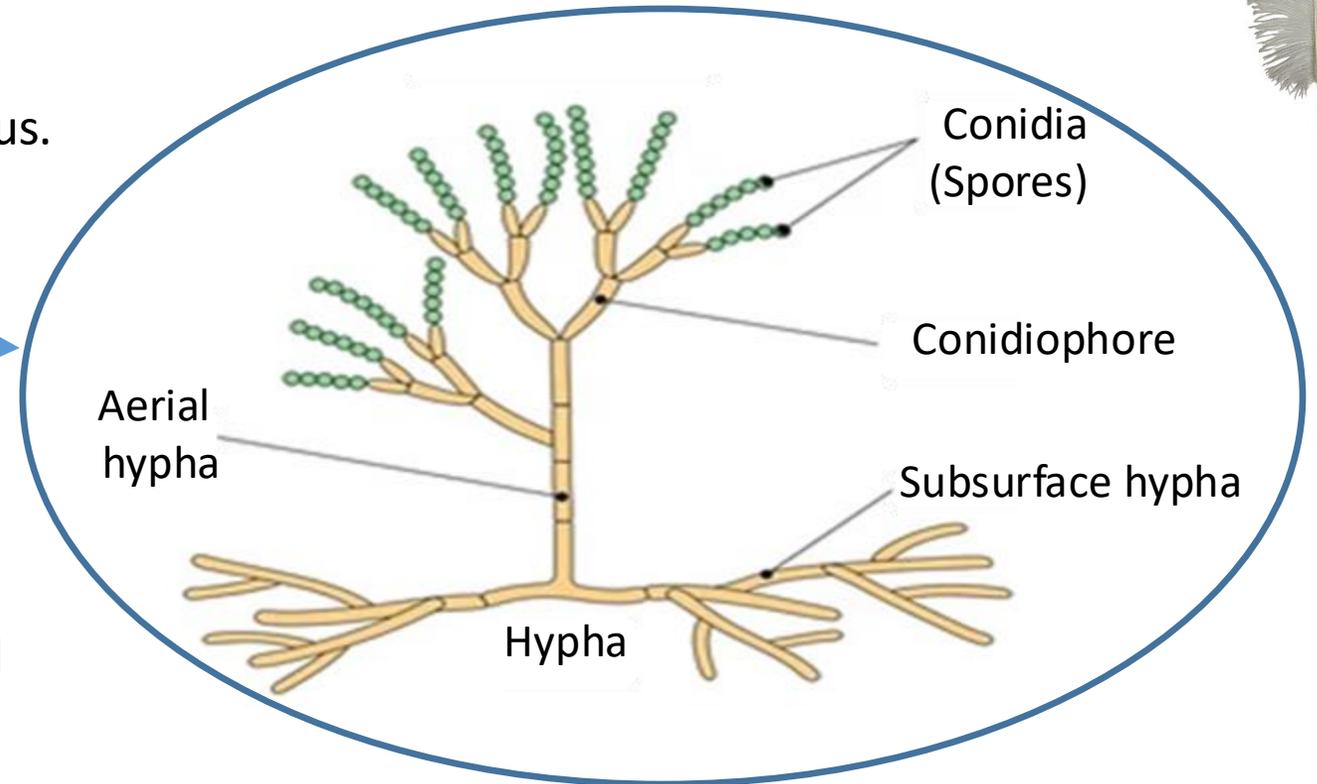


Fungi: Morphological Classification

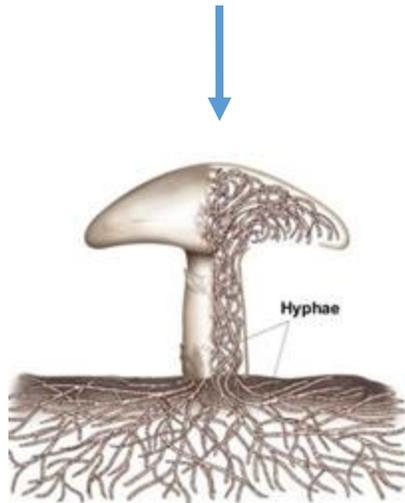
2. Molds:

Examples include Aspergillus, Penicillium, Rhizopus.

The body called **Mycelium**



When hyphal filaments become densely packed into a cohesive tissue gives mushroom.



A conidiophore is a specialized fungal stalk that produces asexual spores called conidia, crucial for fungal reproduction and spreading

Hyphae are the feathery filaments that make up multicellular fungi. They release enzymes and absorb nutrients from a food source.



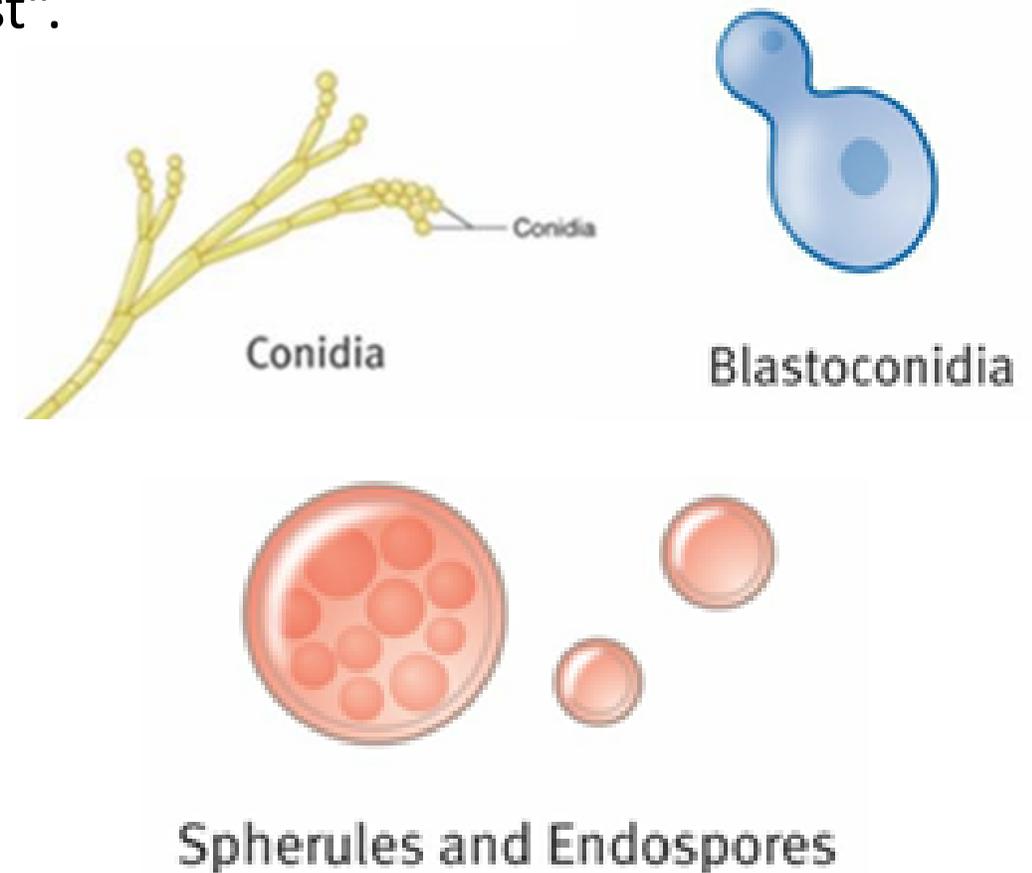
Fungi: Morphological Classification

Conidia

- Conidia are asexual, non-motile spores produced by fungi for reproduction.
- They are formed externally by conidiophores and are dispersed by air to new locations, where they can germinate and grow into a new fungal individual.
- The name "conidium" from the Greek word for "dust".

Spore types include:

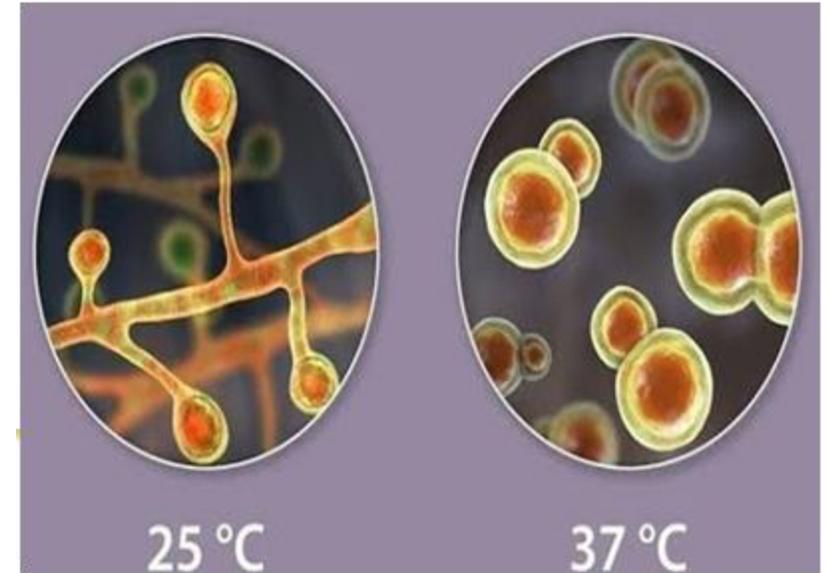
1. Conidia: asexual spores; formed off of hyphae; common; airborne
2. Blastoconidia: "buds" on yeasts (asexual budding daughter yeast cells)
3. Spherules and endospores (Coccidioides): spores inside spherules in tissue.



Fungi: Morphological Classification

3. Dimorphic fungi:

- Many of medically important fungi are dimorphic
- They exist as hyphal/mycelial forms in the soil and in the cultures at 22–25°C and yeasts in human tissue and in the culture at 37°C.
- Dimorphic Fungi Have **HSBC** Bank:
 - **H**istoplasmosis,
 - **S**porothrix
 - **B**lastomycosis
 - **C**ryptomycosis

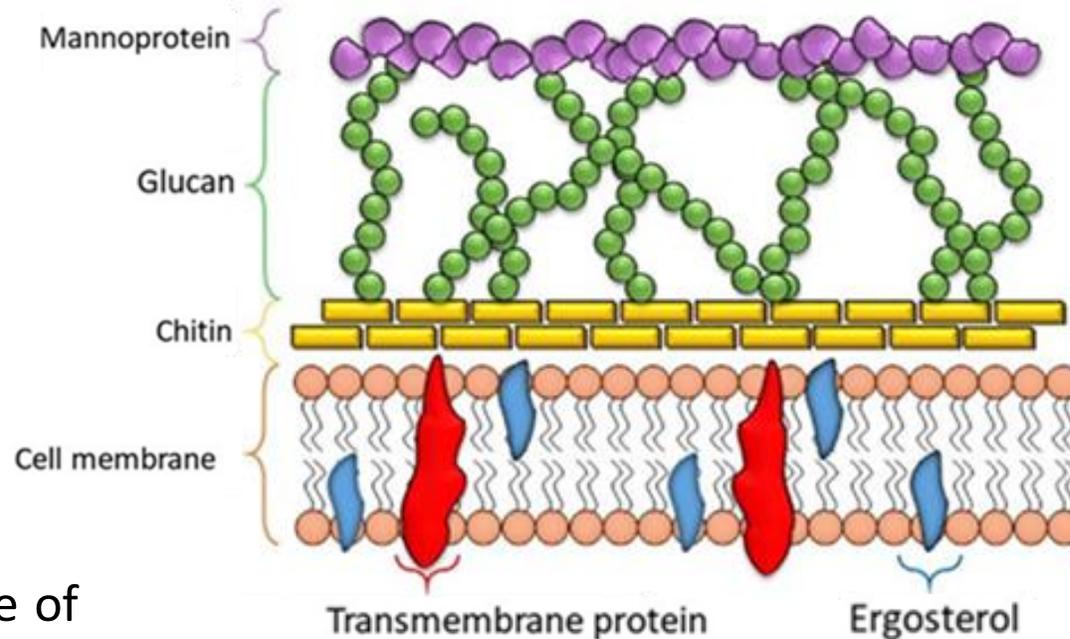


Structure of Fung Cell Membrane and Cell Wall

- The fungi possess rigid cell walls composed of:

Beta-glucan is most important, because it is the target of antifungal drug caspofungin.

Chitin:
It is a linear polysaccharide of the amino sugar N-acetyl glucosamine found in the cell walls of fungi.



Ergosterol:

Structure: the main sterol in fungi and it differs from the structure of cholesterol by the number of double bonds.

Function: is important for fungal growth, proliferation, stress adaptations, and cellular detoxification.

Target of antifungal medication: Imidazole: antifungals inhibit synthesis of ergosterol

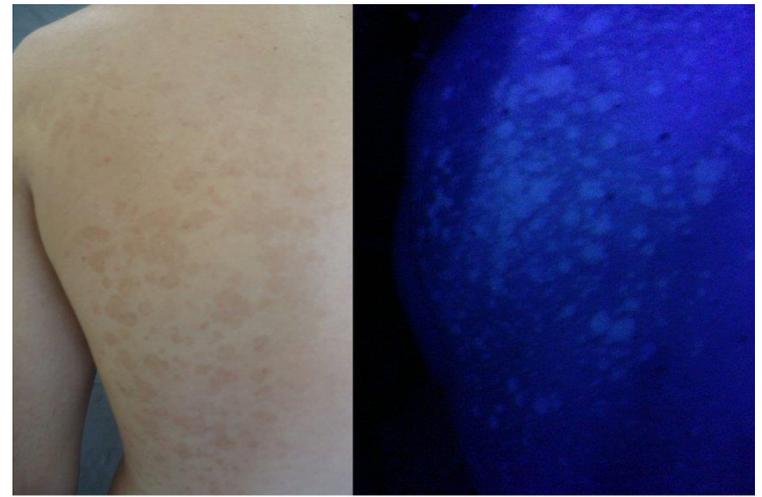
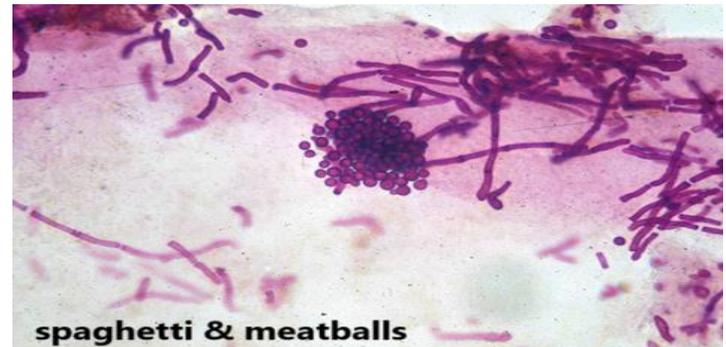
Note: Human cells have cholesterol

Classification based on the site of infection

1- Superficial Mycoses:

Pityriasis Versicolor or called Tinea Versicolor

- **Organism:** *Malassezia furfur* (lipophilic yeast).
- **Pathogenesis:** *M. furfur* feeds on skin lipids, using enzymes like lipases and phospholipases, which disrupts skin balance and produces acids that inhibit melanin through the impairment of the melanocytes function causing hypopigmentation
- **Dx:**
 - **KOH prep:** “Spaghetti and meatballs” (hyphae + yeast).
 - **Fluorescence:** *Malassezia* produces fluorescent substances (fluorochromes) that glow under the UV light of the Wood's lamp.
- **Tx:** Topical azoles, selenium sulfide.



Classification based on the site of infection

2- Cutaneous Mycoses

Definition

- Superficial fungal infections involving the **keratinized layers** of the **skin, hair, and nails**.
- **Causative Organisms called Dermatophytes.**
- ✓ Dermatophytes digest **keratin** → **pruritic, scaly lesions**.

Transmission

- Person-to-person
- Animal contact
- Fomites (combs, towels, gym floors)

Classification based on the site of infection

2- Cutaneous Mycoses

• Common Clinical Types

1. Tinea corporis “ringworm”:

- Corporis means body
- Lesions appear as advancing rings with scaly centers.
- Lesions most often occur on nonhairy areas of the trunk.

2. Tinea capitis (scalp ringworm):

- Small scaling patches involvement the entire scalp with extensive hair loss.
- The hair shafts can become invaded
- Patchy alopecia, scaling, lymphadenopathy
- Often Microsporum or Trichophyton



Classification based on the site of infection

3. Tinea pedis (Athlete's foot)

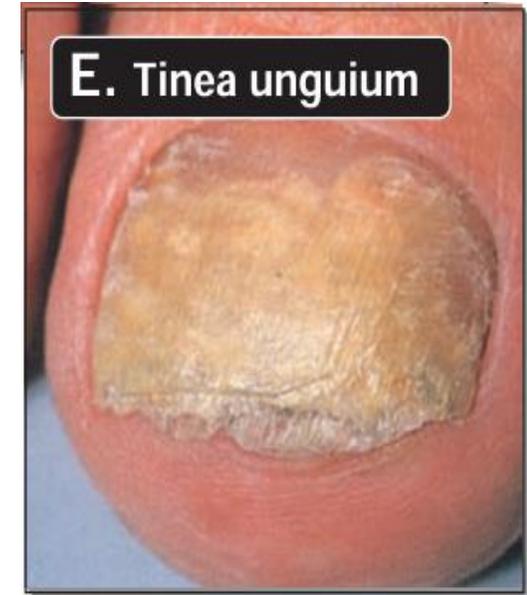
- Interdigital maceration, scaling, vesicles

4. Tinea cruris (Jock itch):

- similar to ringworm, except that lesions occur in the moist groin area
- Groin erythematous plaques with scaling borders

5. Tinea unguium (Onychomycosis)

- Nails thickened, brittle, discolored.
- Treatment must continue for 3 to 4 months until all infected portions of the nail have grown out and are trimmed off.



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Classification based on the site of infection

3. Subcutaneous mycoses

- Subcutaneous mycoses are fungal infections of the **dermis, subcutaneous tissue, and bone**.
- Causative organisms reside in the soil and decaying or live vegetation.

A. Sporotrichosis:

- A granulomatous ulcer at the puncture site, may produce secondary lesions along the draining lymphatics.
- The causative organism is *Sporothrix schenckii*



B. Mycetoma (Madura Foot)

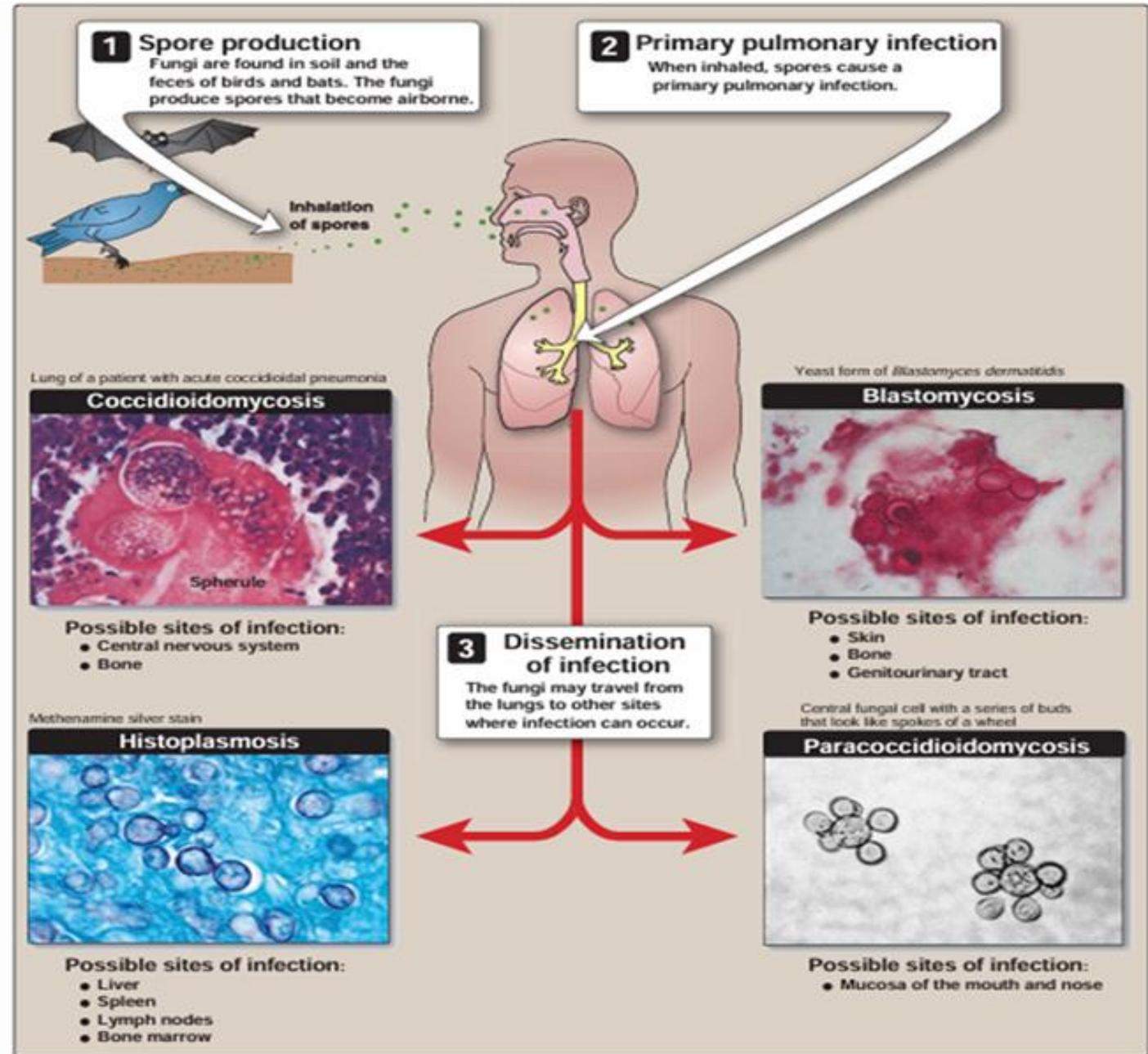
- **Cause:** Fungi (eumycetoma) or actinomycetes (bacterial)
- Mycetoma (tumour-like) chronic granulomatous disease characterized by localized infection of subcutaneous tissues and sometimes bone characterized by discharging sinuses



Classification based on the site of infection

4. Systemic mycoses:

- Dimorphic fungi causing **systemic infection**, especially in immunocompromised.
- Inhaled → primary lung infection → may disseminate



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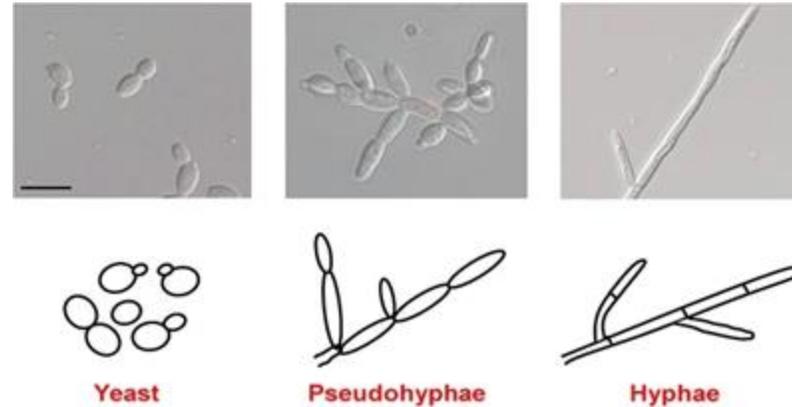
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Classification based on the site of infection

5. Opportunistic mycoses:

A. *Candida albicans*:

- Budding yeast + pseudohyphae
- Oral thrush, vaginitis, esophagitis, endocarditis
- **GERM TUBE positive**
- Tx: azoles; amphotericin B if severe



2. *Aspergillus fumigatus*

- Causes **aspergilloma**, allergic bronchopulmonary aspergillosis, invasive disease
- Tx: voriconazole

3. *Cryptococcus neoformans*

- Encapsulated yeast (India ink halo)
- From **pigeon droppings**
- **Meningitis** in immunocompromised
- Tx: amphotericin B + flucytosine → fluconazole

