

Introduction to medical Mycology

Hira Mushtaq
Lecturer

Centre of biotechnology & microbiology
University of Peshawar, Pakistan

Medical mycology is the discipline that deals with the fungi that causes human disease. These fungal diseases, known as mycoses

- eukaryotic microorganisms
- kingdom of the fungi (Mycota) comprises over 50 000 different species
- 200 of the thousands of species as human pathogens
- taxonomy of the fungi is essentially based on their morphology

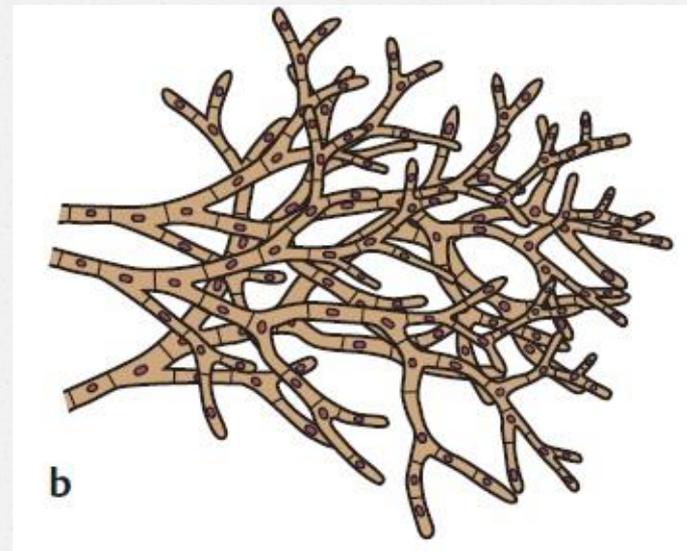
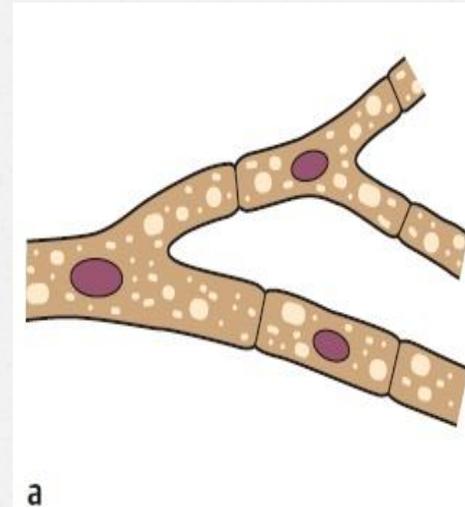
Morphology

- Two morphological forms
- 1. **Hypha:** this is the basic element of filamentous fungi with a branched, tubular structure, 2–10 μm in width (a)
- 2. Crosswalls may form compartments (\pm cells)

Mycelium: this is the web or matlike structure of hyphae (b)

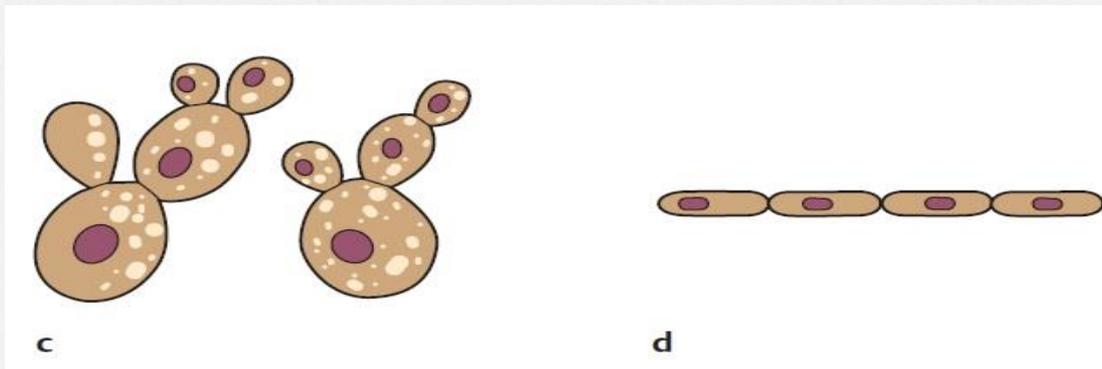
- ❑ Substrate mycelia (specialized for nutrition) penetrate into the nutrient substrate
- ❑ aerial mycelia (for asexual propagation) develop above the nutrient medium.

Thallus /Sclerotium



2. Yeast:

- unicellular fungi (c)
- round to oval and 3-10 μm in diameter.
- yeast cells chained together and resembling true hyphae are called pseudohyphae (d)
- Dimorphism: some fungal species can develop either the yeast or the mycelium
- form depending on the environmental conditions, a property called
- dimorphism. Dimorphic pathogenic fungi take the form of yeast cells in the
- parasitic stage and appear as mycelia in the saprophytic stage.

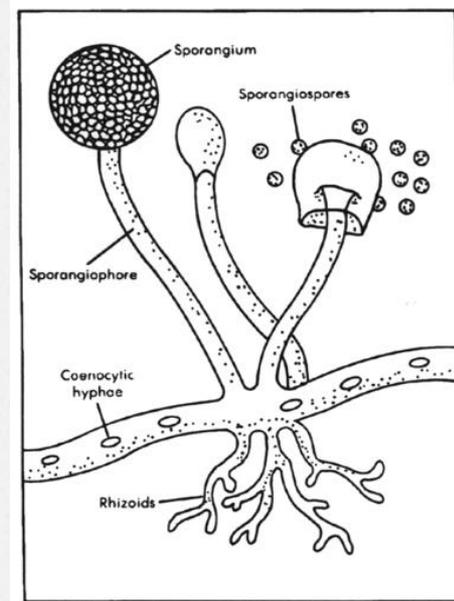


Metabolism

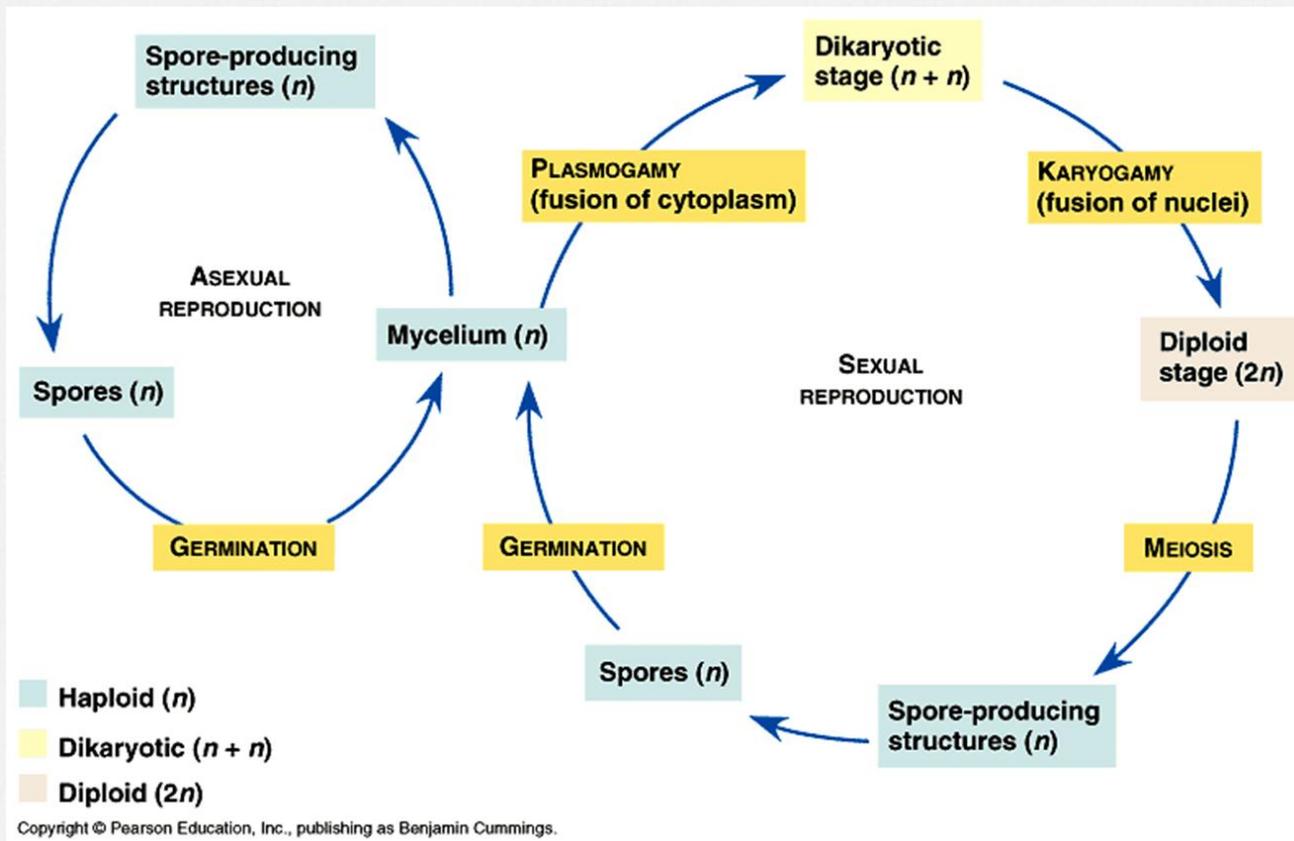
- Heterotrophs dependent on exogenous nutrient substrates as sources of organic carbon
- obligate aerobes
- Found in almost all types of environments i.e. thermophilic, psychrophilic, acidophilic, and halophilic
- Plant pathogens are extensively studied

Reproduction

- release spores (called zoospores) that are produced either sexually or asexually.
- On sac like structure → sporangium found on the tip of every hyphea
- Dispersed widely by wind or water, spores germinate a moist place



Reproduction cycle



Types of fungal infections

1. Superficial mycoses:

- Fungi causes infection of outer surface of hair shafts ,skin shafts and nails.
- They are very rare
- E.g. Black Piedras



Courtesy of M. McGinnis

Copyright © 2000 DoctorFungus Corporation

- **2. Cutaneous mycoses**
- Also called dermatomycoses, ringworms, or tineas
- most common fungal infections
- Infection occurs on the epidermal layer of skin and hair roots
- 3 imp genera
Epidermophyton,
Microsporum, and
Trichophyton
- E.g. Tinea pedis



3. Subcutaneous mycoses

- Cause infection of the subcutaneous layer of skin
- Saprophytic species known
- unable to penetrate the skin, they must be introduced into the subcutaneous tissue by a puncture wound that has been contaminated with soil
- Nodules → become ulcer → protrude out of skin → pus containing drainage
- E.g. chromoblastomycosis
- mycetoma



4. Systemic infection

- Inhalation of fungal spores (wind dispersed soil borne spores) → lesion formation in lungs → bursting of lesion → diffusion in blood
- Species are dimorphic i.e. exist in 2 forms of parasitic and saprophytic both
- E.g. Blastomycosis
Coccidioidomycosis

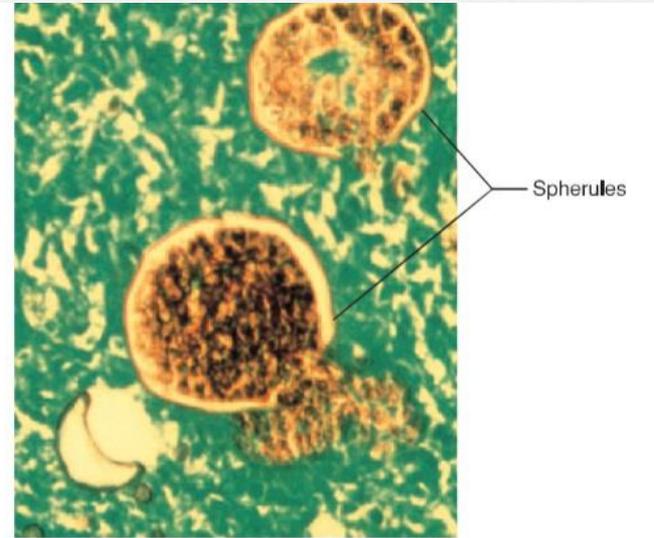


Figure 40.12 Systemic Mycosis: Coccidioidomycosis. *Coccidioides immitis* mature spherules filled with endospores within a tissue section; light micrograph ($\times 400$).

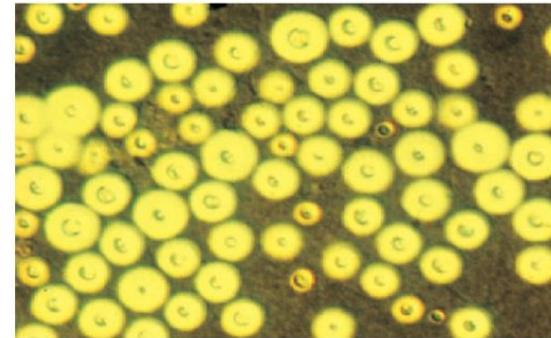


Figure 40.13 Systemic Mycosis: Cryptococcosis. India ink preparation showing *Cryptococcus neoformans*. Although these