



# Medical Mycology

PATH 206

Level 2



# Introduction to Medical Mycology

The topics below are either outside the scope of this course or receive secondary emphasis:

- ▶ Mushroom poisoning - ingestion of toxins present in mushrooms (mycetismus)
- ▶ Mycotoxicosis - ingestion of a fungal toxin.
- ▶ Allergies - except a complication of one of the fungal diseases discussed.
- ▶ Veterinary medical mycology

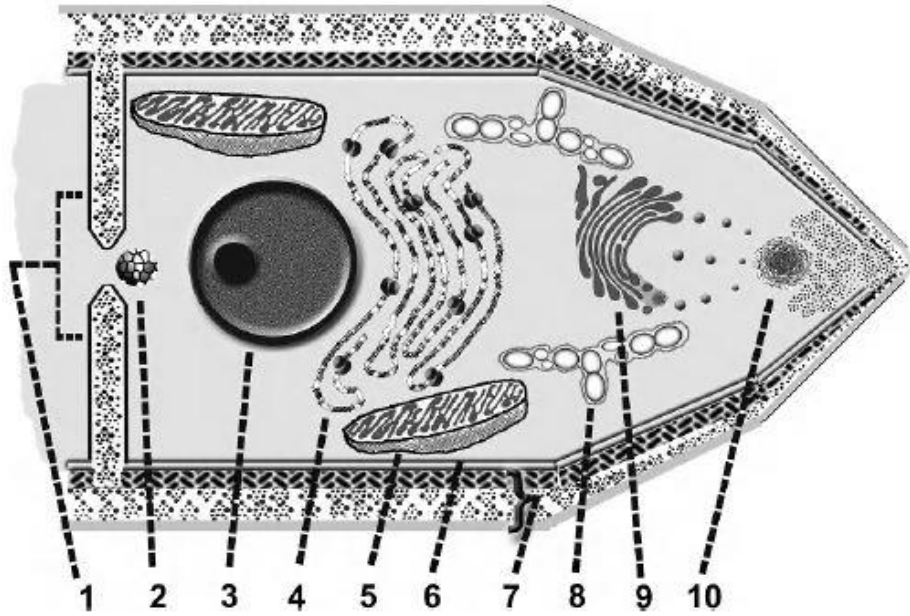
# Definition of fungi: Their ecological niche

## What are fungi ?

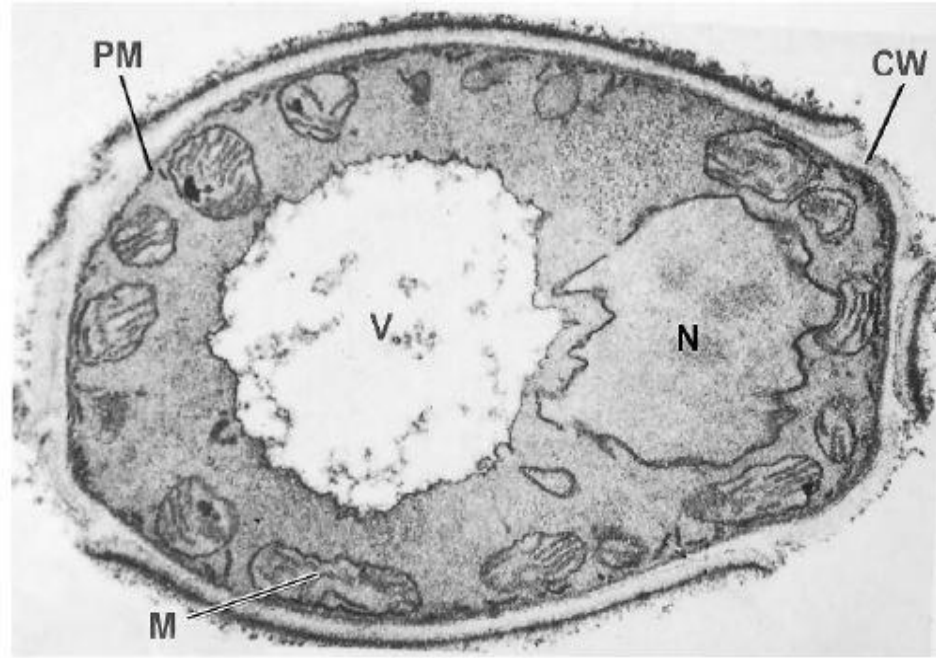
The kingdom fungi composed of:

- ▶ Unicellular or multicellular.
- ▶ Eukaryotic.
- ▶ Heterotrophic microbes.
- ▶ Each of fungal cell is bounded by a rigid cell wall containing chitin, glucans and/or cellulose.

- ▶ Each fungal cell contains of a full array of organelles.



Organelles of the hyphal tip: 1, septum with septal pore; 2, Woronin body; 3, nucleus with nucleolus; 4, rough endoplasmic reticulum; 5, mitochondrion; 6, cell membrane; 7, cell wall in three layers—inner layer (chitin), middle layer (glucan), and outer layer (mannan); 8, tubular vacuole; 9, Golgi; 10, *spitzenkörper*.



Ultrastructural features of the yeast cell visualized in a transmission EM depicting a cross section of yeast cell. CW, cell wall; PM, plasma membrane; N, nucleus; V, vacuole; M, mitochondria.

- Thousands of fungal species
  - free living in nature
  - pathogenic for plants
- Only small group
  - pathogenic for humans and animals
- It is also true that any fungus capable of growing at 37° c is potential pathogen in debilitated or immunocompromised hosts.
- Some fungi
  - Primary pathogens
    - cause disease in immune-normal persons e.g. Coccidioides species
- Severity of fungal disease:
  1. Host factors
    - Immune status
    - General health status
  2. Number of infectious propagules inhaled, ingested or injected
    - Conidia
    - Spores

- Persons who are immunocompromised or otherwise debilitated, are prone to develop more serious disease and to be susceptible to opportunistic fungi against which immune-normal persons have a high level of resistance.
- There is essentially no part of our earth where fungi are not found.
  - ▶ A few fungal species are adapted to live as commensals in humans.
  - ▶ But for most fungal pathogens humans are accidental hosts.

## Medical Mycology:

- ▶ What is medical mycology?

is a distinct discipline of medical microbiology concerned with all aspects of disease in humans and lower animals caused by pathogenic fungi.

- ▶ What are the mycoses?

are diseases of humans and animals caused by pathogenic fungi.

- ▶ There is a board spectrum of mycoses ranging from superficial skin disease to deep-seated, multisystem disseminated diseases.

## A brief History of Medical Mycology

- ▶ Fungi were discovered earlier than bacteria and viruses.
- ▶ Mushrooms were the first microorganisms known.
- ▶ In the past, most fungi cause skin infections or cosmetic infections, where bacteria and viruses cause serious fatal diseases, so there was no interest of studying fungi.
- ▶ In ancient Greece, Hippocrates (460-377 B.C.), the father of medicine, recognized that persons with oral thrush (due to Candida albicans) were already debilitated by other diseases.
- ▶ In the middle Ages, Children in Europe became infected with favus, a fungal disease of scalpe, smooth skin, even nails, due to Trichophyton schoenleinii.



In general, the vast majority of fungal diseases are not spread from person to person (are not communicable).

However, there are significant exceptions, for example dermatophytes.



- ▶ The AIDS epidemic in the United States, beginning in 1981, was brought to the attention of infectious disease specialists, when pneumocystosis was encountered.

Pneumocystosis

→ Pneumocystis pneumonia

So, when HIV infection was discovered, increasing number of immunocompromising conditions, they found that fungi produce fatal diseases; from that time, fungi return to be in focus again.