



Medical Mycology

Lecture (1)

By

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Fundamental Medical Mycology



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 WILEY-BLACKWELL

Introduction to medical mycology

MYCOLOGY : is the study of fungi

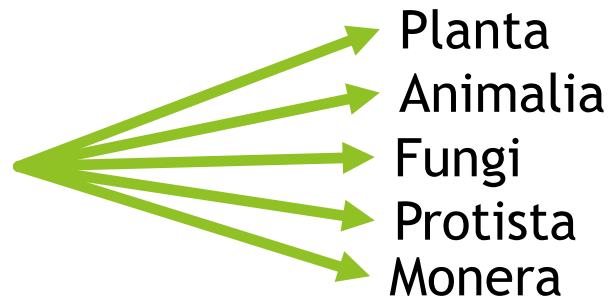
Fungi

The Study Of

- includes their genetic and biochemical properties
- their taxonomy
- their use to humans as source of:
 1. medicinals (e.g., penicillin),
 2. food (e.g., beer, wine, cheese, mushrooms ...),
 3. as well as their dangers, such as poisoning or infection.

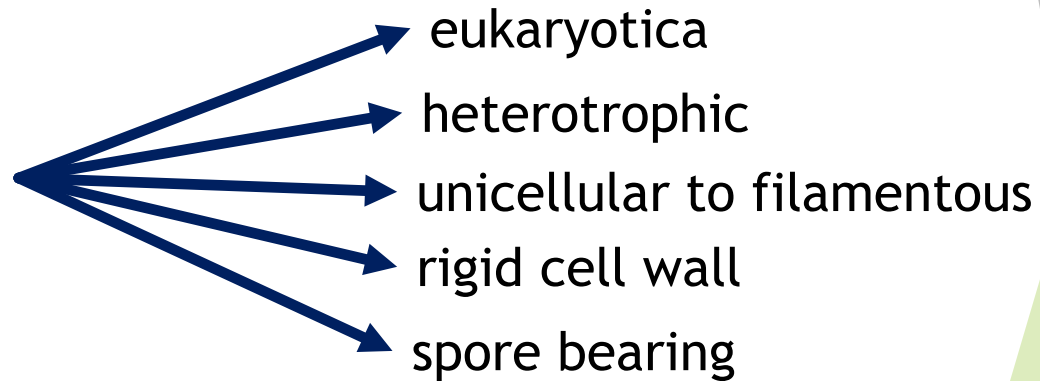
Definition of fungi

living world



} **Kingdoms**

Fungi are



Definition of fungi

A- Eukaryotic cells

contain membrane bound cell organelles including nuclei, mitochondria, Golgi apparatus, endoplasmic reticulum, lysosomes etc.

B- Heterotrophic

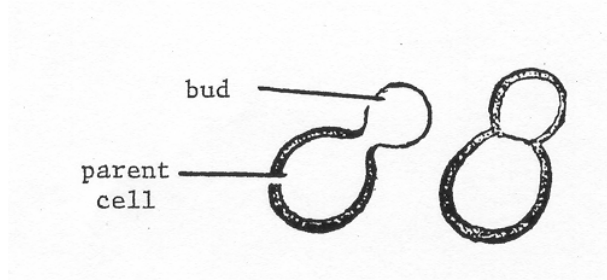
Saprophytes (living on dead organic matter) or Parasites (utilizing living tissue).

C- Like plants

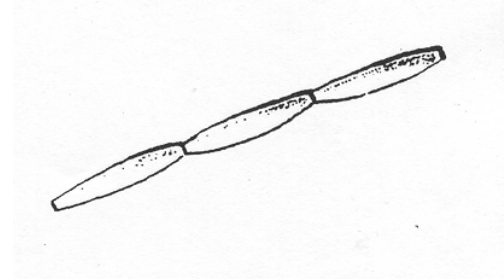
fungi have rigid cell walls and are therefore non-motile, a feature which separates them from animals.

Structure of Fungi.

(a) A unicellular or yeast



blastoconidia



pseudohyphae

(b) A filamentous or mould

which is a vegetative growth of filaments

There are two kinds of hyphae

1- non-septate (belong to the Zygomycetes)

2- septate (found in the Basidiomycetes and Ascomycetes)

DIMORPHIC FUNGI

1. Growth as a mold in Soil or media
(SDA, PDA)

incubated at 25° C

2. Growth as a yeast in the tissues of an
animal/human or media
(Brain heart infusion agar)
(BHI)

incubated at 37° C

Example : Candida albicans

Reproductive Fungi

1. Sexual reproduction

produced by the fusion of two nuclei that then generally undergo meiosis.

1. **plasmogamy** (cytoplasmic fusion of two cells)
2. **karyogamy** (fusion of two nuclei)
3. **genetic structure and meiosis** (The resulting haploid spore)

e.g. Zygosporoes, Ascospores and Basidiospores.

Reproductive Fungi

2. Asexual reproduction

(somatic or vegetative reproduction)

occurs by many of mechanisms:

1. Budding

2. Fission

3. Fragmentation of hyphae

4. Asexual spores

Classification of Fungi

Separation of taxa based on
the method of spore production

Three major phylum

**Zygomycota, Ascomycoea and
Basidiomycota**

There is a sub-phylum

Deuteromycotina (imperfect fungi)
which may represent the asexual states
(anamorphs) of either Basidiomycota or
Ascomycota.

Antifungal agent

1-Polyene Antifungal Drugs

Amphotericin, nystatin, and pimaricin

interact with sterols in the cell membrane to form channels through which small molecules

leak from the inside to the outside.

Antifungal agent

2-Azole Antifungal Drugs

**Fluconazole, itraconazole, and
ketoconazole**

inhibit cytochrome P450-dependent enzymes
involved in the biosynthesis of ergosterol,
which is required for fungal cell membrane
structure and function

Antifungal Azoles are synthetic drugs

Antifungal agent

3- Allylamine and Morpholine **Antifungal Drugs**

inhibit ergosterol biosynthesis at the level of squalene epoxidase.

4- Antimetabolite Antifungal Drugs

Fluorocytosine

inhibitor of both DNA and RNA synthesis

Lab Diagnoses of Mycoses

1- Clinical presentation

- History - Physical Exam
- Mould or Yeast? -Septate hyphae?

2- Culture of organism (days to weeks)

- SDA , SDA with antibiotics , BHIA

3- Serology-Antibody or Antigen tests

4- Molecular Biology-PCR

Medical mycology

Mycosis: Any fungal disease. Tend to be chronic because fungi grow slowly.

Opportunistic mycoses:

- AIDS and cancer patients
- Individuals treated with antibiotics for long time
- Very old or very young individuals (newborns)

Aspergillosis: Inhalation of Aspergillus spores

Candidiasis or Yeast Infections:

Caused mainly by Candida albicans

Mycoses are classified into the following categories:

1. Systemic mycoses:

Attack the deep tissues and organ systems
Usually caused by fungi that live in the soil
and are inhaled of spores .

Histoplasmosis

Initial infection in lungs. Later spreads
through blood to most organs

Coccidiomycosis

Like tuberculosis

Two categories of systemic disease

A- Those caused by pathogenic fungi

ability to cause disease in the normal human host

B- Opportunistic fungi

require the patient's defenses to be lower before the infection is established.

2-Cutaneous mycoses:

Fungal infections of the skin, hair, and nails.

Secrete keratinase, an enzyme that degrades keratin. Infection is transmitted by direct contact or contact with infected hair (hair salon) or cells

- Ringworm (*Tinea capitis* and *T. corporis*)**
- Athlete's foot (*Tinea pedis*)**
- Jock itch (*Tinea cruris*)**

3- Subcutaneous mycoses

Fungal infections under the skin.

Caused by fungi that live in soil or on vegetation.

Infection occurs by implantation of spores or mycelial fragments into a skin wound.

Can spread to lymph vessels.

4- Superficial mycoses

Fungal infections under the skin.

**infect lower layers of skin
[nails or hair] (Dermatophytosis)**

Superficial Fungal Infections

Skin Infections , do not penetrate deeper tissues. No inflammation. there is no cellular response from the host.

1-Malassisa infection

2-Black piedra

3- White piedra

4- Tinea nigra

Clinical manifestations

1- Pityriasis versicolor

This is a chronic, superficial fungal disease of the skin

white, pink, beige, or brownish lesions.

The colour varies according to the **normal pigmentation of the patient, exposure of the area to sunlight, and the severity of the disease**

Young adults are affected most often, but the disease may occur in childhood and old age.

Clinical manifestations

2. Pityriasis folliculitis

-It is a skin disease especially prevalent in young men. Itching is normal.

usual seat is the back with a possible front of the chest

3. Seborrhoeic dermatitis and dandruff

harmless, itchy, red skin and scaling rash affecting the face, scalp eyebrows, ears and upper trunk.

Clinical manifestations

4. Fungaemia

They are rare and occur in premature infants

Transmission

The fungus exists as a free living saprophyte and probably spread from one to another by exposure to patient's scales

Lack of personal hygiene facilitates

Laboratory diagnosis

1- Clinical material

**Skin scrapings from patients ,
blood from patients with
suspected fungaemia.**

2. Direct Microscopy

3. Culture

4. Serology

**There are currently no commercially
available serological procedures for
the diagnosis infections.**

Treatment

1. use a topical imidazole in a solution
2. Ketoconazole shampoo has very effective
3. In severe cases or in cases with lesions resistant to topical treatment oral therapy with - or itraconazole

انتهت المحاضرة

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