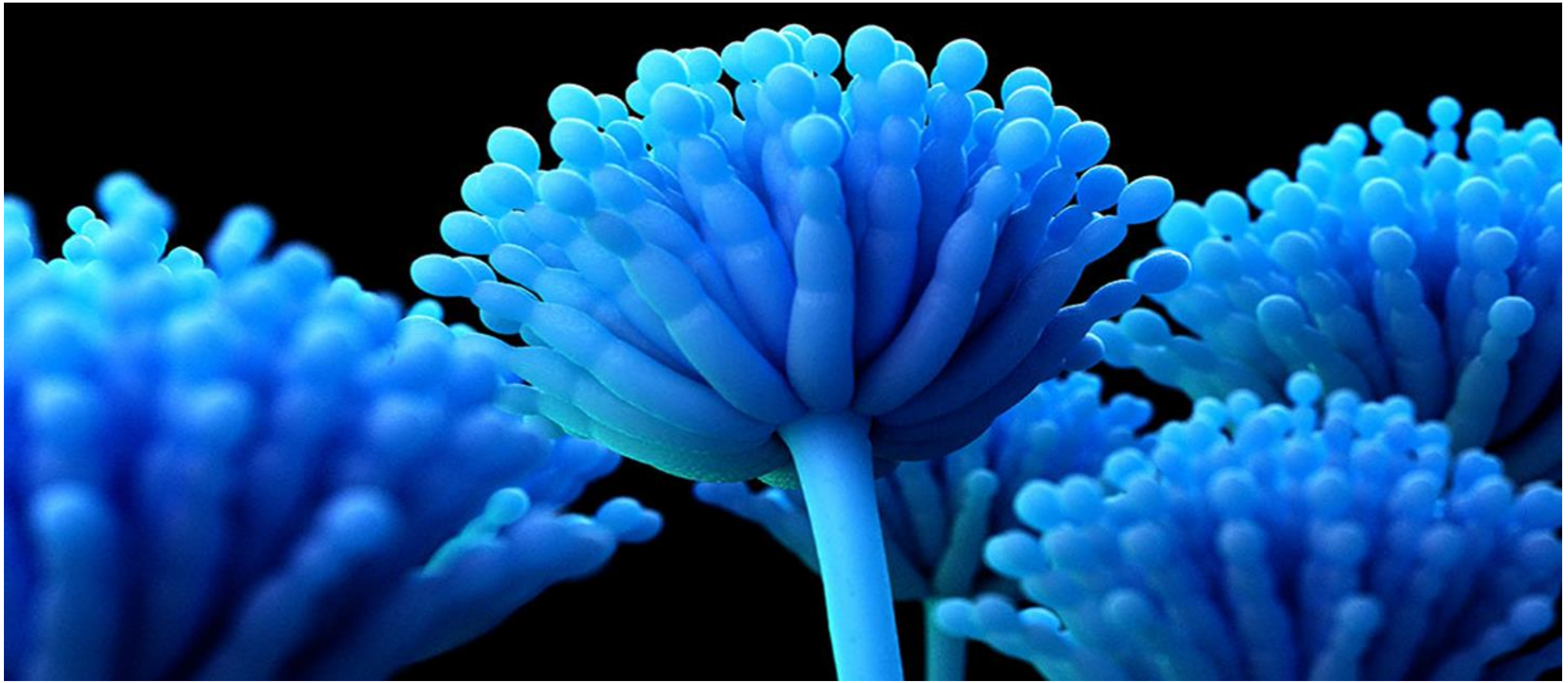
Subcutaneous & Deep Mycoses

By Prof. Hala Tabl



Subcutaneous mycoses

These are caused by fungi that grow **in soil and on vegetation** and acquired only when the fungus is **implanted** into subcutaneous tissues by **trauma.**

The important Subcutaneous mycoses include:

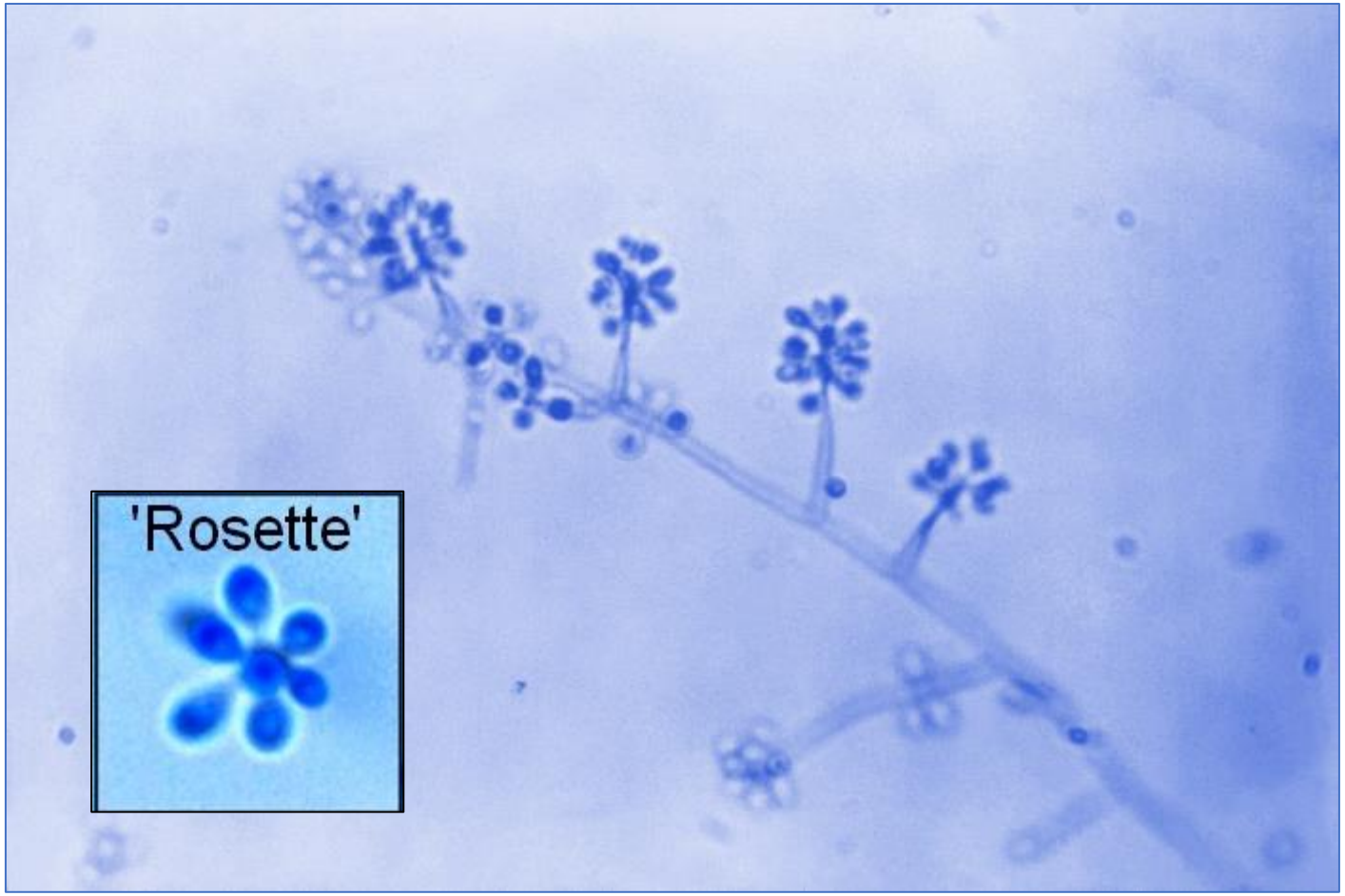
(1) Sporotrichosis

(2) Mycetoma (Madura foot)

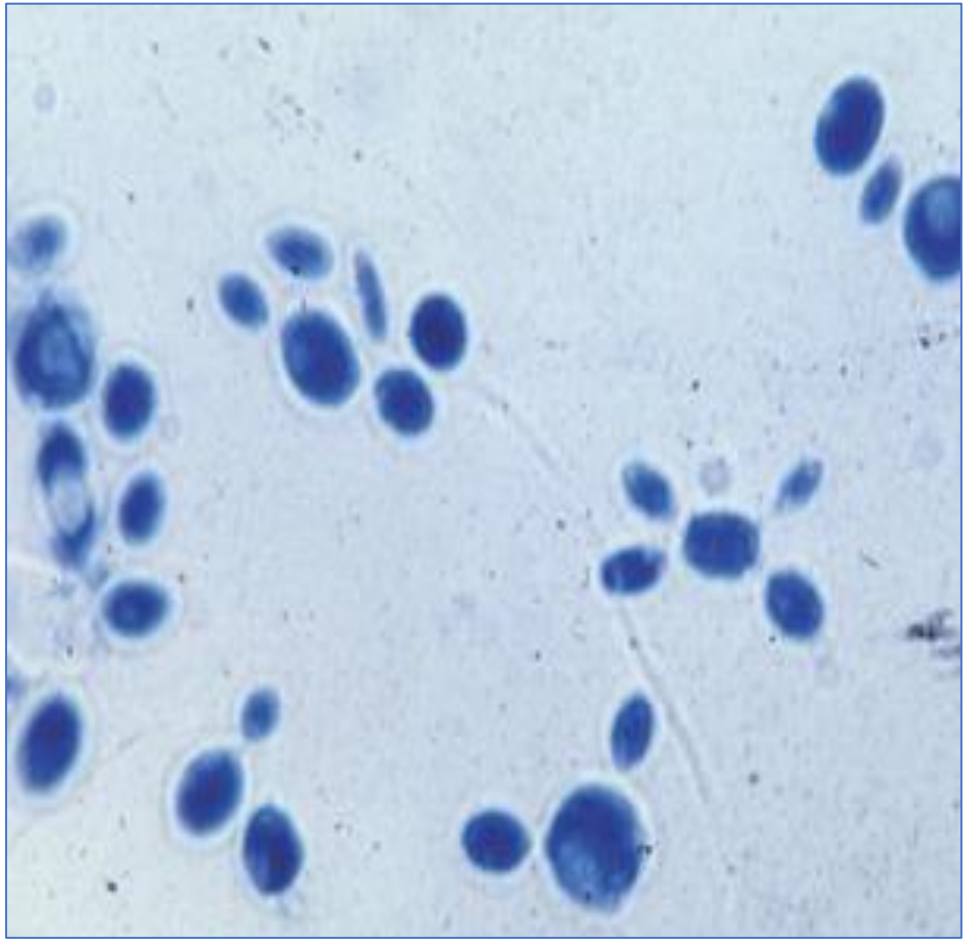
Sporotrichosis

“Rose gardener's disease”

- Caused by **Sporothrix schenckii, a dimorphic fungus.**
- Spores of the mold found on rose thorns, hay, sphagnum moss, twigs, and soil, and introduced into the skin, typically by a **thorn**, cuts or abrasions, so, occurs most often in **gardeners** or farmers because they may be stuck by a **rose thorn**.
- It occurs in the form of a local nodule (which may ulcerate) with nodules along the draining lymphatics.



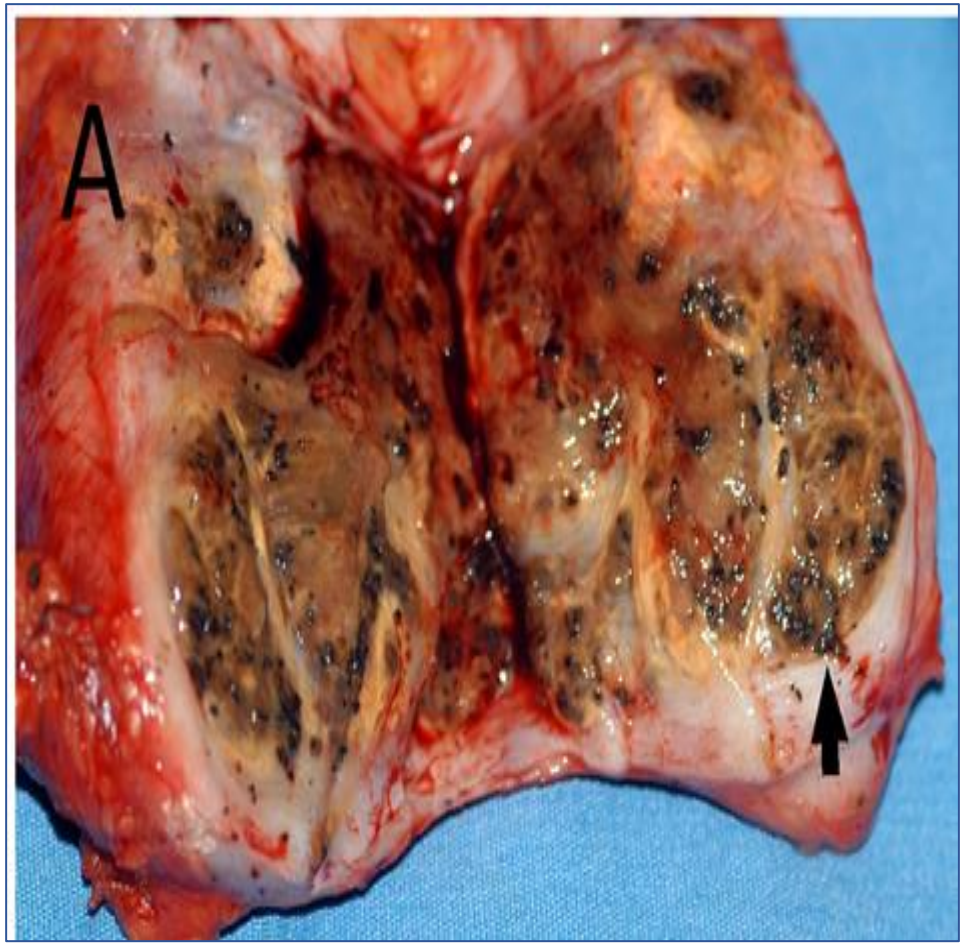
Mold phase: Septate hyphae with oval conidia in clusters with characteristic flowery shape.



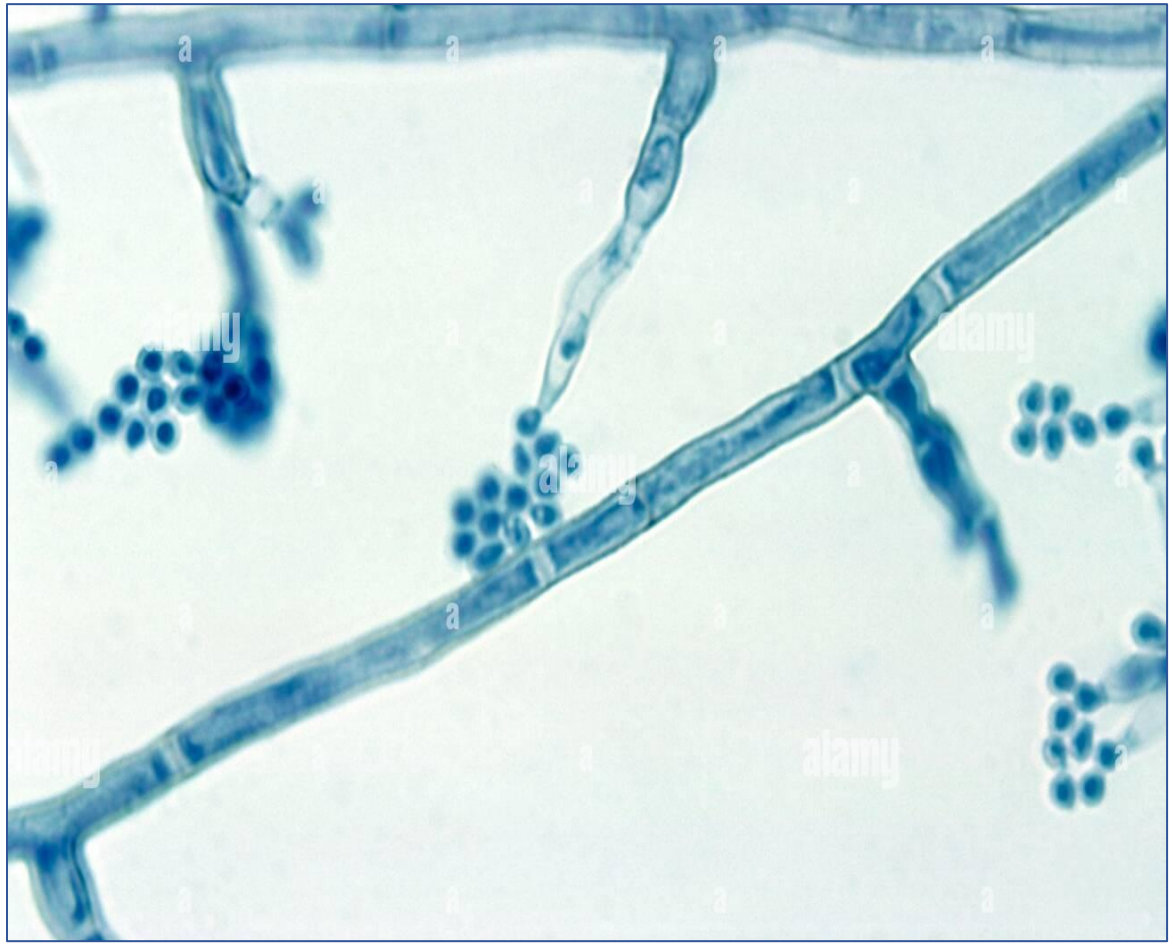
Yeast phase: Round or cigar-shaped budding yeasts

Mycetoma

- Caused by **mold Madurella mycetomatis.**
- Foot is the common site affected and usually called **"Madura foot".**
- A localized chronic granuloma with progressive destruction of deeper tissues.
- Mycetoma swelling is **nodular** and contains **sinuses** which usually open on the surface of the skin, discharging **mucopus** containing **small black granules** which are compact colonies of the causative organism.



Black granules in infected tissue



Septate hyphae and chlamydospores

Deep Mycoses
(Systemic Mycoses)

Important examples of systemic (deep) mycoses are:

- **Candidiasis.**
- **Histoplasmosis.**
- **Cryptococcosis.**
- **Aspergillosis.**

Opportunistic mycoses

Fungi that fail to induce disease in most immunocompetent persons but can do so in those with impaired immunity.

Important examples of opportunistic fungi:

- **Candida spp.**
- **Cryptococcus spp.**
- **Aspergillus spp.**
- **Mucormycetes (Mucor, and Rhizopus)**

CANDIDIASIS

- Systemic (invasive) candidiasis is a serious infection of the blood or other normally sterile sites. Affect mostly immunosuppressed and hospitalized individuals.
- Candida albicans (budding yeast) is the commonest cause of candidiasis, but C. tropicalis and C. parapsilosis are important pathogens also.
- Infection is mostly **blood borne** e.g. Central venous catheters, intravenous drug use, Major surgery,..)
- **Systemic Candidiasis include:**
  1- Candida bloodstream infection (candidemia).
  2- Broncho-pulmonary infection.
  3- Endocarditis.
  4- Meningitis.
  5- Endophthalmitis (infection within the eye).

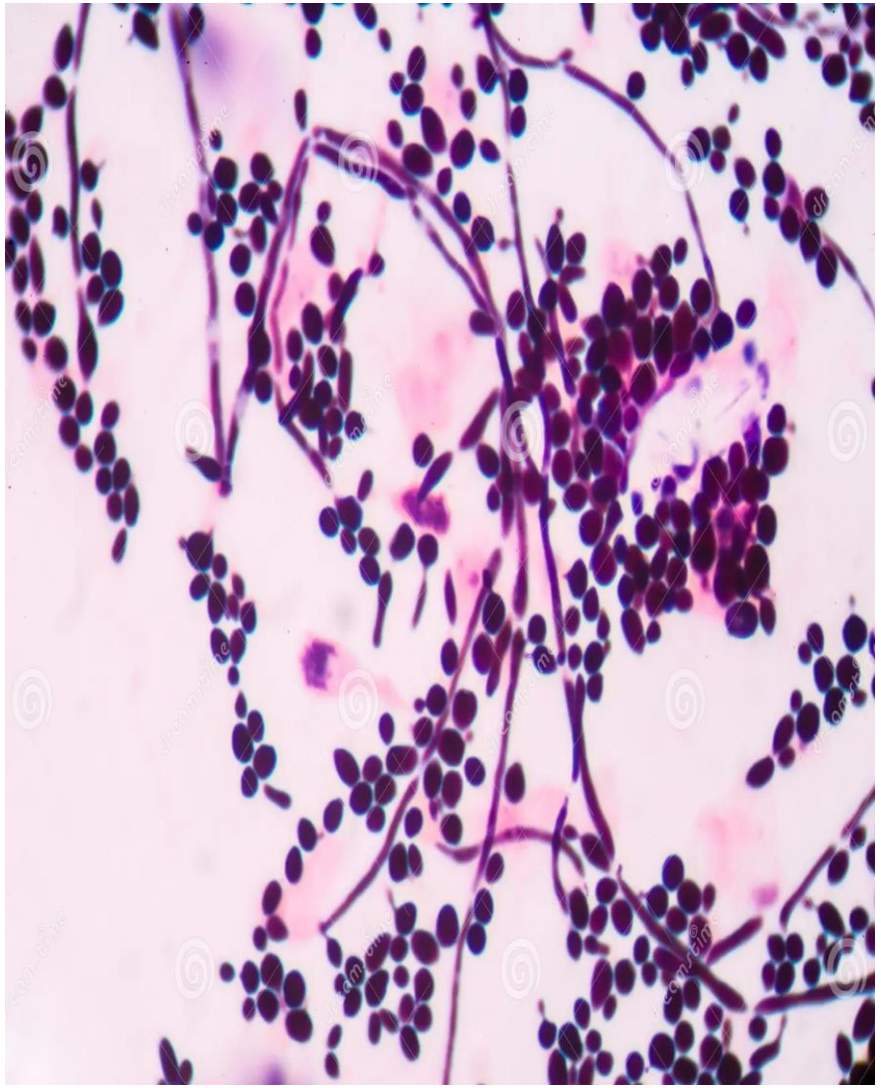
Laboratory Diagnosis

➢ **Specimen:** According to the lesion:

- In superficial candidiasis: Skin scraping, vaginal discharge, oral swab,..
- In deep candidiasis: Blood, Urine, Sputum,…

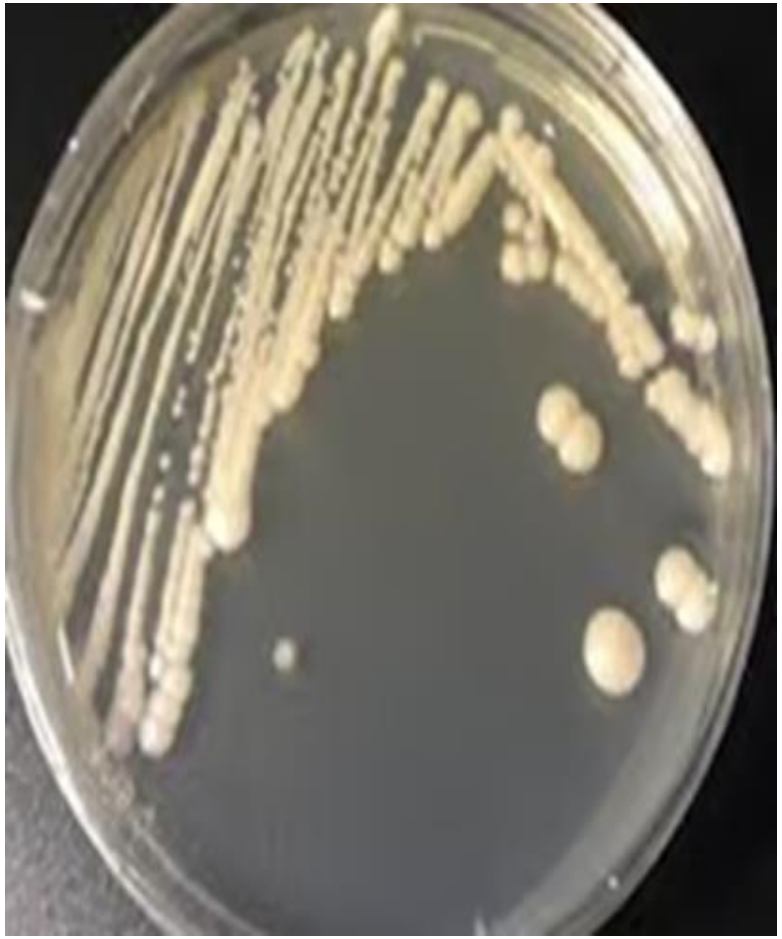
➢ **Direct microscopy:**

In **Gram stained film,** candida appear as Gram + ve, oval, **budding cells with pseudohyphae**.



➢ **Culture:**

On **sabouraud's** agar at **37°C** for 1-2 days, colonies are cream colored, pasty, with distinctive yeast smell.



➢ **Biochemical reactions:**

C. albicans ferment Glucose & Maltose (acid&gas) and Sucrose (acid only).

➢ **Serology**

A rise in antibody titer is of diagnostic value in diagnosis of deep candida infections.

➢ Differential tests:

To differentiate between *C. albicans* and *non-C.albicans* species e.g. *C.tropicalis* & *C.krusei*.

1- Germ tube test:

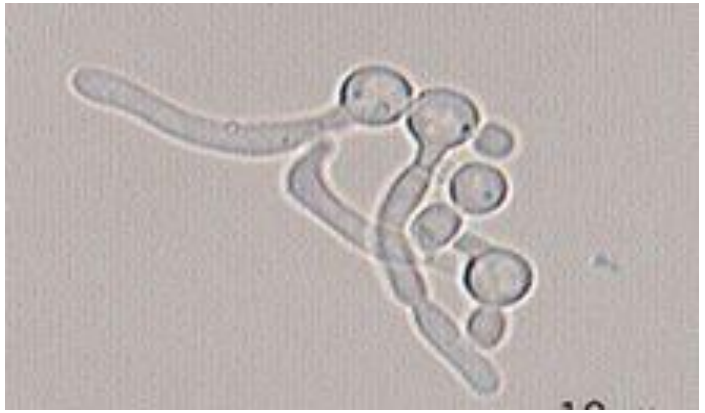
When Candida is grown in human serum at 37°C for 3 hours, they forms a germ tubes (**tubal outgrowth** extending from yeast cells). ***C. albicans*** **gives + ve test**.

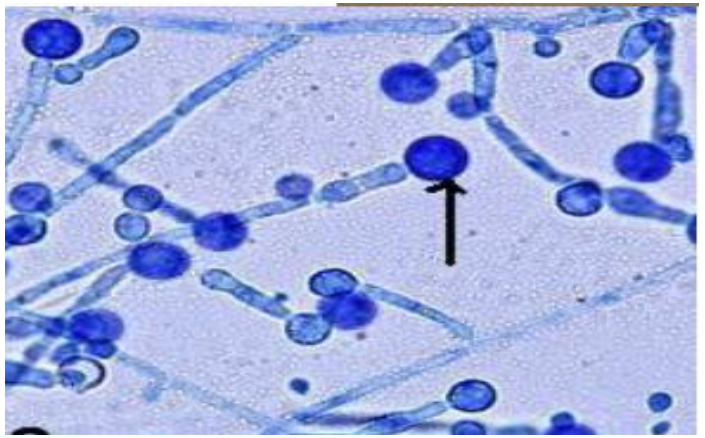
2- Chlamydospore formation:

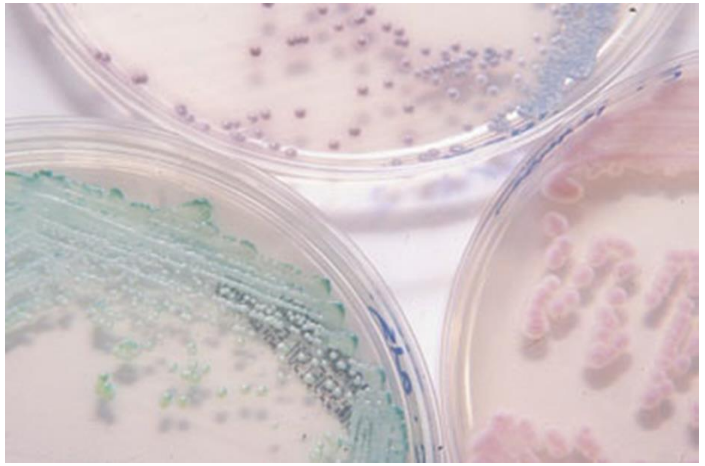
When candida is cultured on **corn meal extract agar** medium (deficient medium), it produce **pseudohyphae and chlamydospores.** ***C. albicans*** **gives + ve test**.

2- Chrom agar (Indicator media):

Different candidas give different colored colonies.







ASPERGILLOSIS

- It is a group of **opportunistic** mycoses caused by Aspergillus Fungi which are common **saprophytic molds** frequently found on decaying vegetation.
- Medically important species are:

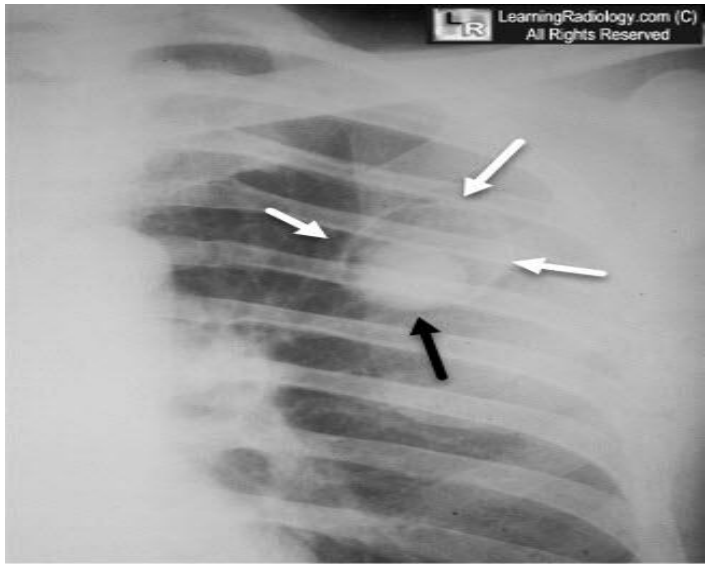
1- Aspergillus Fumigatus.

2- Aspergillus Niger.

3- Aspergillus Flavus .

Aspergillus Fumigatus:-

Causes **pulmonary Aspergillosis,** (in patients with a pre-existing lung disease).



1- Aspergilloma or " Fungus ball":

- Fungus grow in a pre- existing cavity e.g. T.B. cavity.
- X- ray shows fungus ball.

2- Invasive Aspergillosis:

- Mainly occurs in **immunocompromised** persons, and usually fatal.
- Fungus invades lung tissues giving rise to pneumonia and hemoptysis.
- Dissemination to other organs occur leading to **disseminated Aspergillosis.**

3- Allergic bronchopulmonary aspergillosis.

Aspergillus Niger:

- Causes **otomycosis,** chronic infection of the external auditory meatus.
- Manifested by pain, itching and ear discharge.

Aspergillus Flavus:

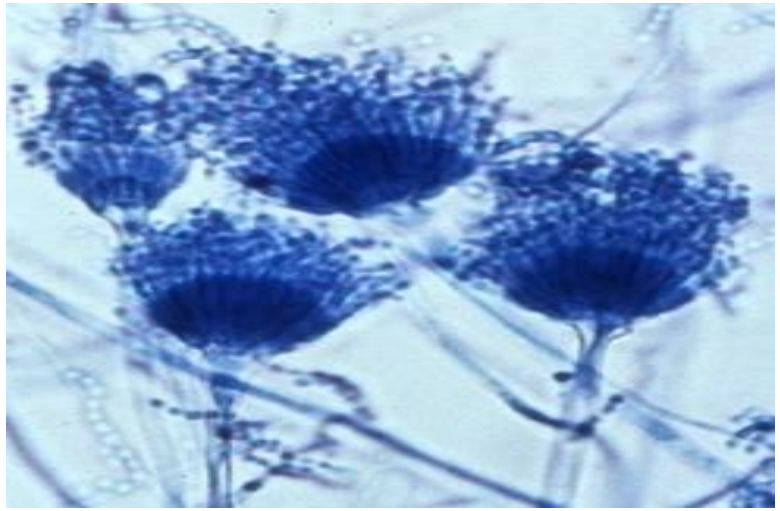
- Produce **aflatoxins** which cause chronic damage & neoplasm in liver (Cancer liver)

Laboratory Diagnosis

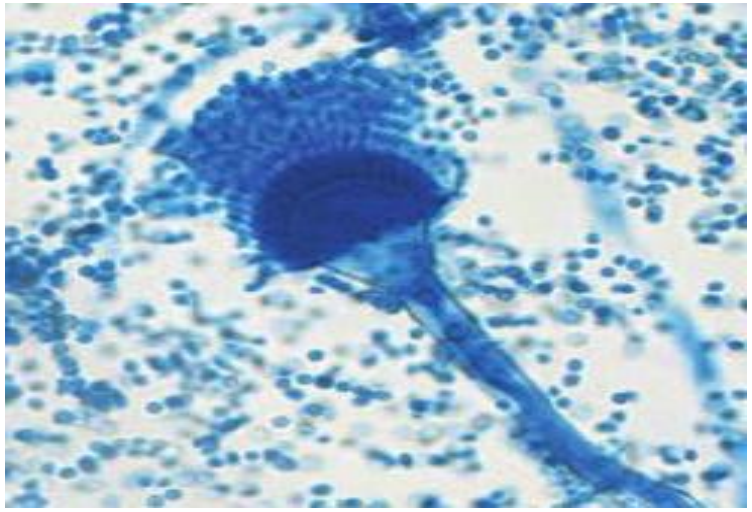
Specimen: According to the site of lesion (Sputum, Ear discharge,…).

Direct Microscopy:-

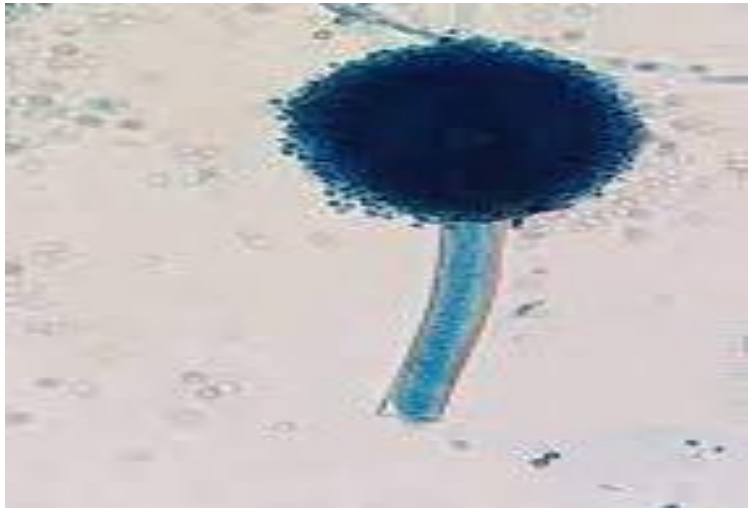
Shows **filamentous septate hyphae** with characteristic **aspergillus head** in lactophenol cotton blue preparations.



A. Fumigatus
Flask shaped head



A. Flavus
Hemi-spherical head



A. Niger
Rounded head

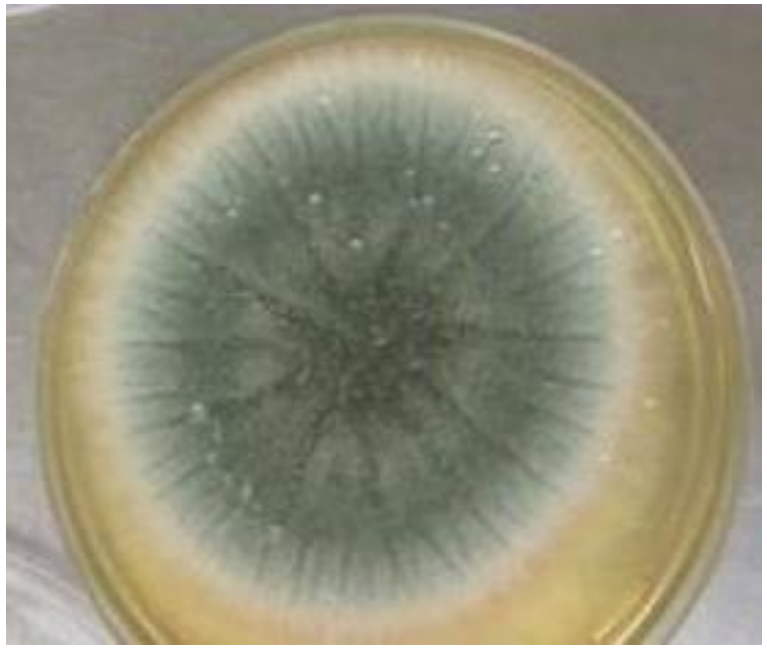
Culture:-

On **Sabouraud's** agar. Pigmentation of **aerial growth** can identify the Aspergillus species.

A. Fumigatus →White filaments with **smoky green** spores.

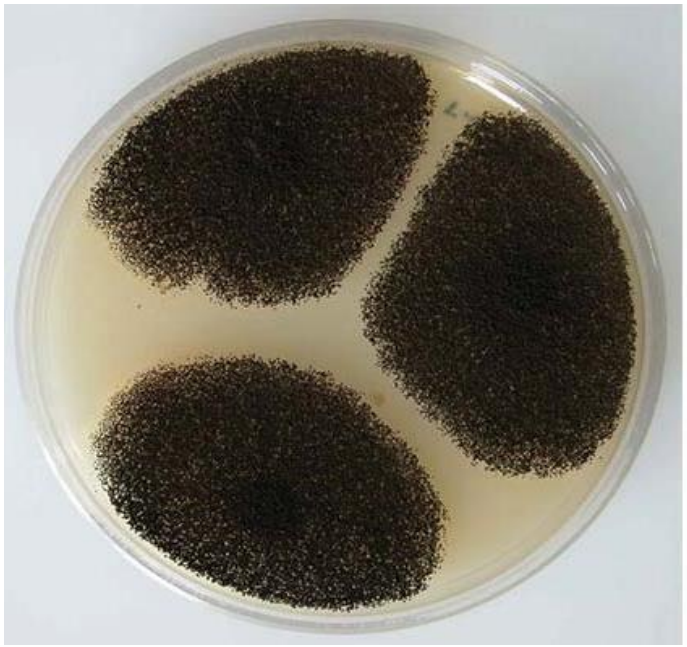
A. Flavus →White filaments with **yellowish green** spores.

A. Niger →White filaments with **black** spores.



A. Fumigatus

A. Flavus



A. Niger

HISTOPLASMOSIS

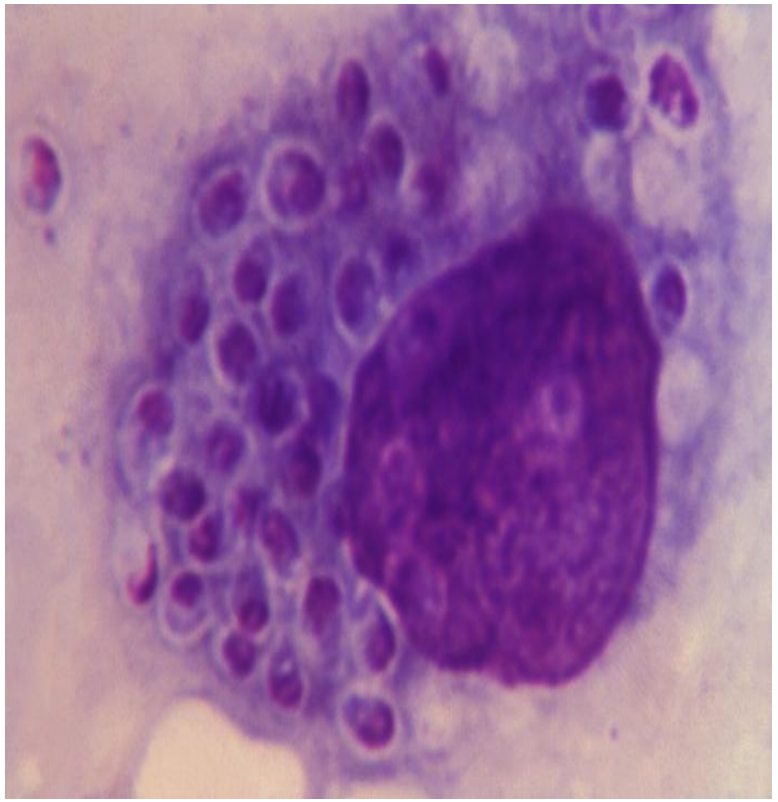
- It is an **intracellular** mycoses of the **Reticuloendothelial system.**
- Caused by **dimorphic** Fungi called ***Histoplasma capsulatum.***
- Infection is acquired by **inhalation** of the spores. Inhaled spores are engulfed by alveolar **macrophages**, resist intracellular killing and develop into budding cells. Spores may spread from the lung to any part of the body.
- Infection may be either:

Asymptomatic

Acute: Due to heavy exposure. Similar to pneumonia.

Disseminated: into reticuloendothelial system with lymphadenopathy, enlarged liver & spleen, high fever and anemia.

Laboratory diagnosis



Specimen

Sputum, Bone marrow aspirate or blood.

Direct Microscopy

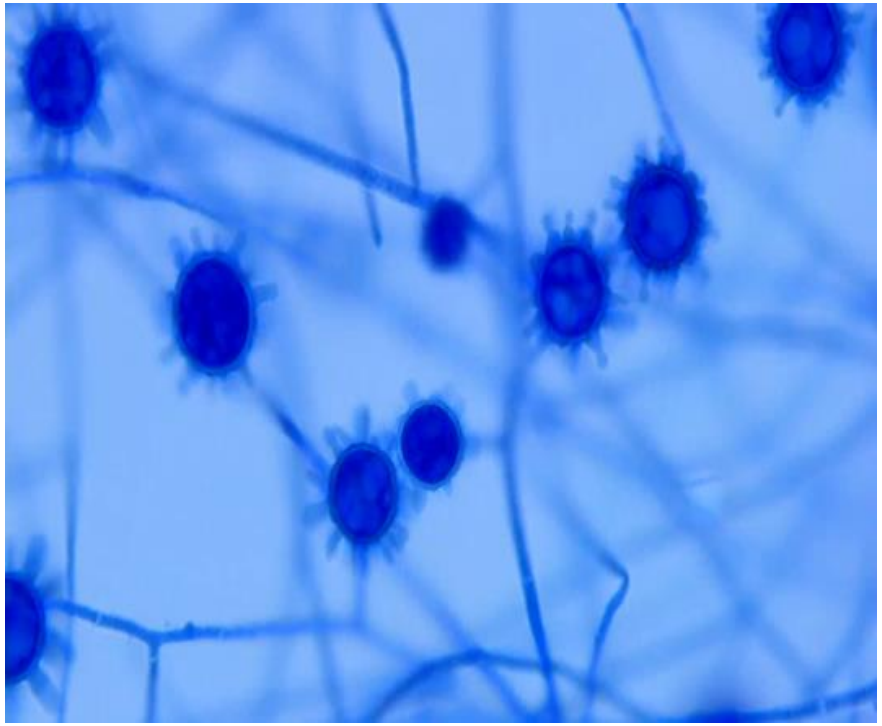
In **Giemsa** stained preparations,

yeast form can be seen **intracellular** as round or oval budding cells.

Culture

- On sabouraud's agar at **room temperature** for up to 3 weeks produce **filamentous** growth.

*A lactophenol cotton blue stained film show **septate hyphae** and round spores with **finger like projections**.

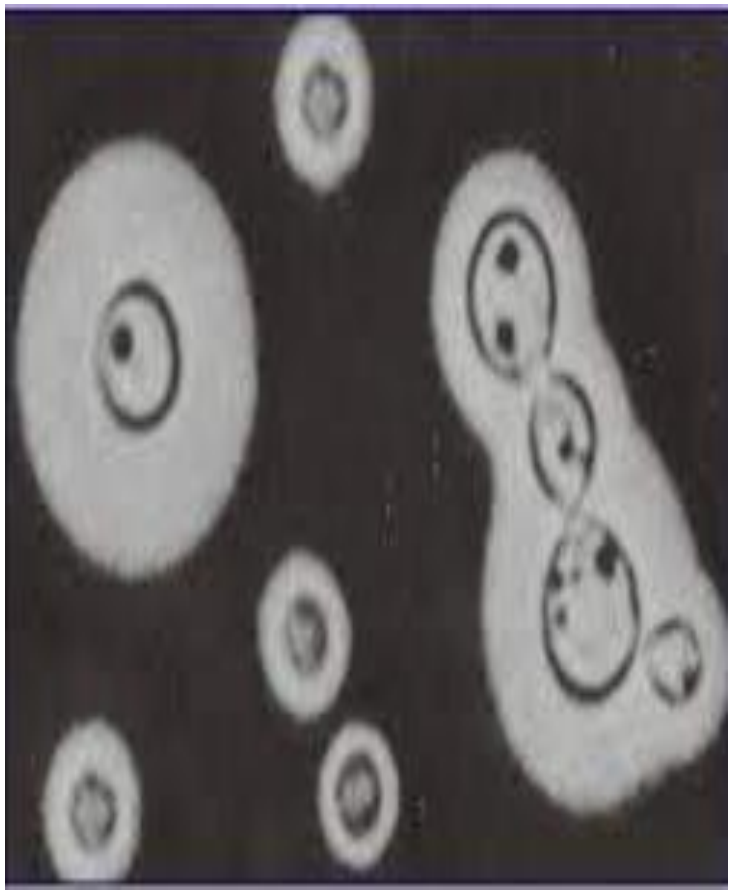


- **At 37ºC** produce the **yeast form** (budding cells).

CRYPTOCOCCOSIS

- **Opportunistic** mycoses usually affecting the lungs, brain and meninges.
- Caused by a **budding yeast** called ***Cryptococcus neoformans.***
- Found in large amounts in dry **pigeon faeces** and this is the main source of human infection.
- Human infection occur by **inhalation** of yeast cells or its spores.
- **In normal persons the infection may be:-**Asymptomatic or mild pulmonary symptoms.
- **In immunocompromised Persons:** A primary pulmonary infection occurs and then disseminates mainly to **Meninges.**
- **Clinically** the commonest manifestation is chronic meningitis with a fluctuating course usually called:- **"Cryptococcal meningitis "**.
- It is fatal unless treated.

Laboratory Diagnosis



Specimen: C.S.F. or Sputum.

Direct microscopy:

Yeast cells of *cryptococcus neoformans* can be detected best in an **India ink** preparation from C.S.F.

-Cells appear rounded surrounded by **a wide capsule (white unstained halo)** against a **black background.**

Culture:-

On **sabouraud's** agar at 37ºC for 2-3 days, colonies are cream colored, **mucoid** & Shiny.

Serology:

Detection of **capsular Ag** by latex agglutination in C.S.F of patients is of **diagnostic value.**

MYCOTOXINS

Mycotoxins are toxins produced by fungi.

General criteria of mycotoxicosis:

*Not transmissible between persons.

*Associated with foods ingestion, inhalation or contact.

*No effect of antifungals in treatment.

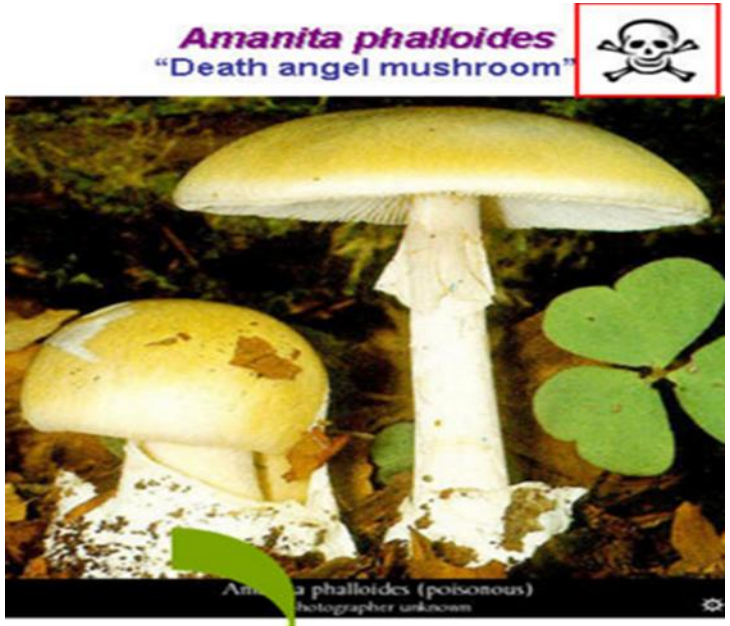
*They are resistant to heat.

Examples:

(1) Poisonous mushrooms (e.g. Amanita mushroom) is potent hepatotoxin.

(2) Aflatoxin, produced by ***Aspergillus flavus***, causes neoplasm in liver (Cancer Liver).

(3) Ergotism, is caused by the mold ***Claviceps purpurea***, which infects grains and produces alkaloids (e.g., ergotamine) that cause vascular and neurologic effects.



The Quiz Time

A girl who pricked her finger while pruning some rose bushes, develops a local pustule that progresses to an ulcer. Several nodules then develop along her forearm. The most likely agent is:

A) Aspergillus fumigatus.

B) Sporothrix schenckii.

C) Madurella mycetomatis.

D) Candida albicans.

E) Histoplasma capsulatum.

A 50-year-old woman receiving chemotherapy via a subclavian catheter for acute leukemia. She presented with fever and stiffness in the neck with clinical suspicion of meningitis. CSF culture grew budding yeasts that formed germ tubes. The organism most likely causing this infection is:

A) Cryptococcus neoformans.

B) Candida albicans.

C) Candida krusei.

D) Histoplasma capsulatum.

E) Candida tropicalis.

Aspergillus fumigatus can be involved in a variety of clinical conditions.

Which one of the following is LEAST likely to occur?

A) Tissue invasion in immunocompromised host.

B) Allergy following inhalation of airborne particles of the fungus.

C) Colonization of tuberculous cavities in the lung.

D) Thrush.

E) Pneumonia and hemoptysis.

A 30-year-old woman has a painless ulcer on her tongue. She is HIV patient. Biopsy of the lesion revealed yeasts within macrophages. What is the most likely diagnosis?

A) Candidiasis.

B) Cryptococcosis.

C) Sporotrichosis.

D) Histoplasmosis.

E) Aspergillosis.

Mycotoxins are toxins produced by fungi.

Which of the following statements best describes aflatoxin?

A) It is readily treated with antifungal drugs.

B) It is transmissible between persons.

C) It causes chronic damage and neoplasm in liver.

D) It is produced by poisonous mushrooms.

E) It is produced by *Aspergillus fumigatus.*


Thank
you