Lecture 6: lect. Dr. Ahmed Yaseen Abed

Infection due to filamentous fungi (Zygomycosis and Aspergillosis).

Zygomycosis (Mucormycosis)

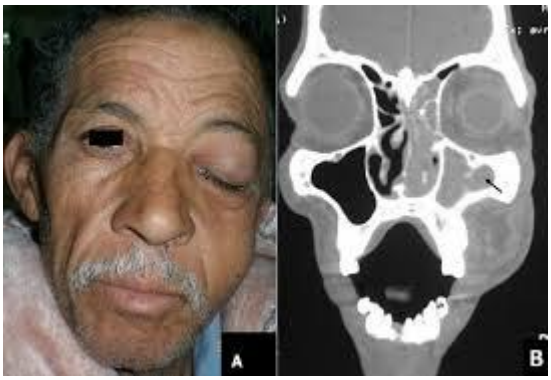
A. Overview and Pathogenesis

Zygomycosis, also called mucormycosis, is a rare but aggressive fungal infection. Fungi of the Mucorales group are ubiquitous in nature and typically enter the body via inhalation or through skin injuries.

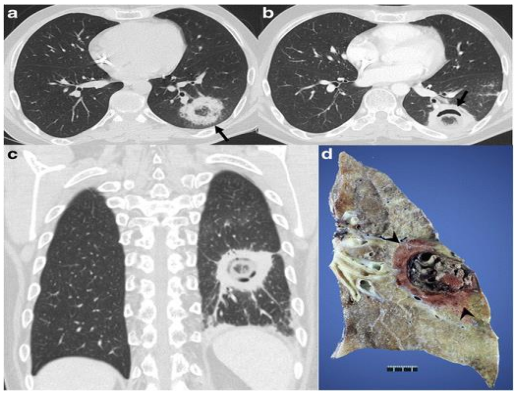
Pathogenesis: Spores germinate in host tissues, forming hyphae that invade blood vessels, causing tissue necrosis.

B. Types of Mucormycosis

Rhinocerebral Mucormycosis Common in diabetics with ketoacidosis. Involves sinuses and can spread to the brain, causing severe complications.



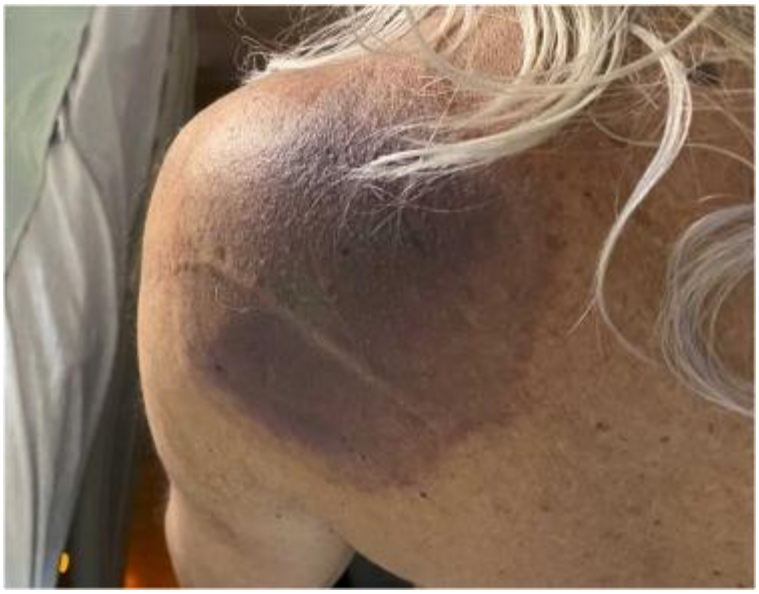
Pulmonary Mucormycosis Affects the lungs, primarily in immunocompromised individuals. Can mimic pulmonary aspergillosis on imaging.



Cutaneous Mucormycosis Caused by direct inoculation of fungal spores into the skin. Common in trauma or burn patients.

Gastrointestinal Mucormycosis Rare; typically occurs in malnourished or premature infants.

Disseminated Mucormycosis Involves multiple organ systems and has a high mortality rate.



C. Clinical Manifestations of Mucormycosis

Rhinocerebral: Fever, facial pain, sinusitis, black necrotic lesions on the nasal mucosa.
Pulmonary: Fever, cough, hemoptysis, pleuritic chest pain.

Cutaneous: Necrotic skin lesions, painful and erythematous plaques.

Gastrointestinal: Abdominal pain, vomiting, gastrointestinal bleeding.

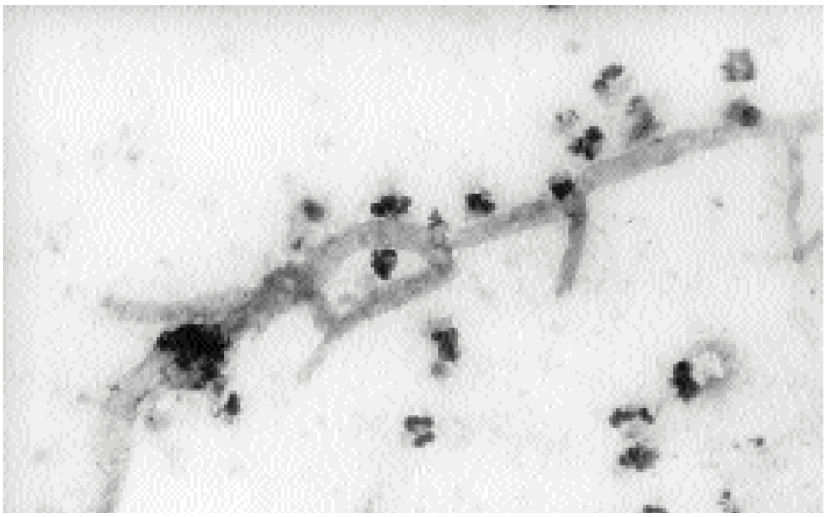
Disseminated: Multi-organ failure and sepsis-like symptoms.

D. Diagnosis of Mucormycosis

Clinical suspicion in high-risk patients is crucial.

Imaging: CT and MRI can reveal tissue invasion and necrosis.

Histopathology: Non-septate hyphae with right-angle branching.



Culture and Molecular Techniques: Confirmation via culture or PCR.

E. Treatment of Mucormycosis

Early Surgical Debridement: Removal of necrotic tissue is often necessary.

Antifungal Therapy: Liposomal Amphotericin B is the first-line treatment.

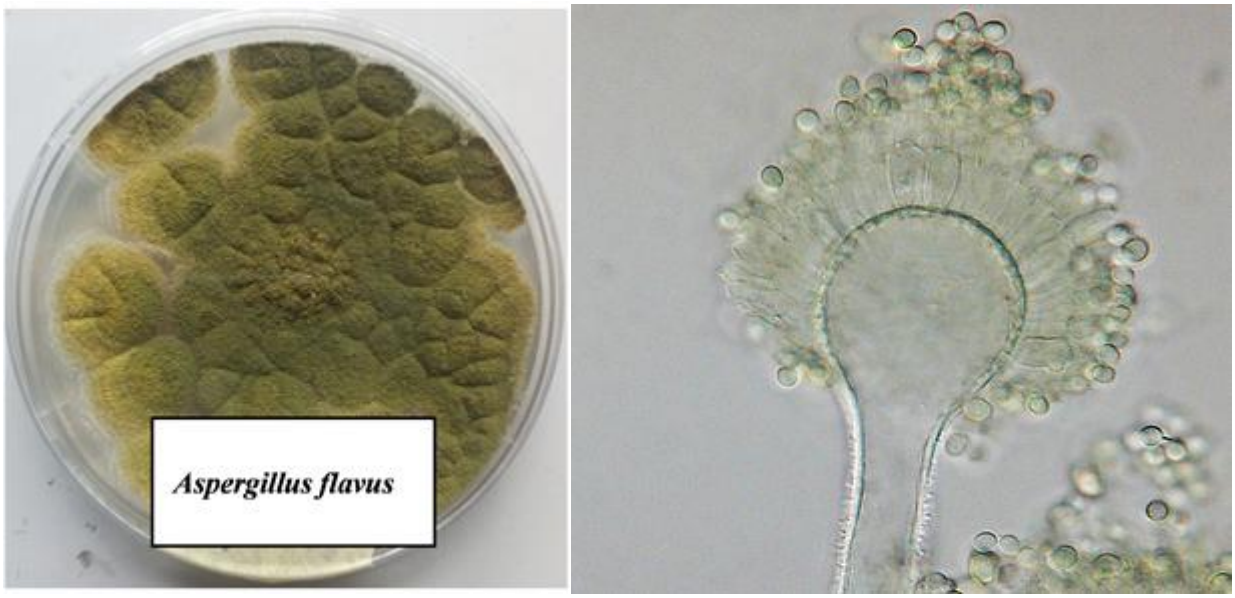
Adjunctive Therapies: Correcting underlying conditions like ketoacidosis and immunosuppression.

Aspergillosis :-

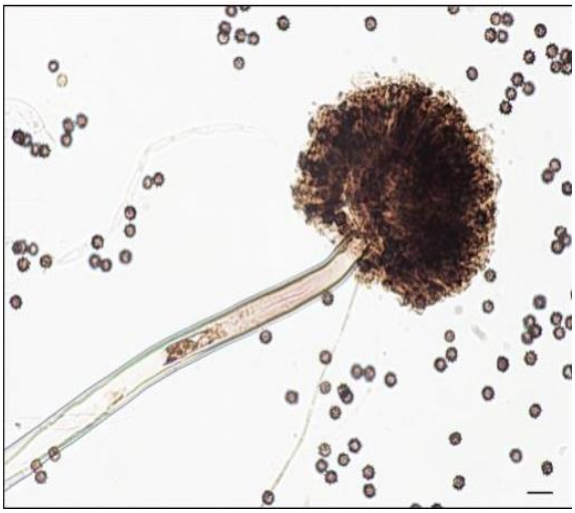
Aspergillus spp. are widely distributed fungal moulds found in soil and other organic matter. They have also been isolated in air-conditioning systems. There are more than a hundred different species but most human disease is caused by *Aspergillus fumigatus* or *Aspergillus niger*. Occasionally, *Aspergillus clavatus* and *Aspergillus flavus* cause human illness.

Wha Is Aspergillosis?

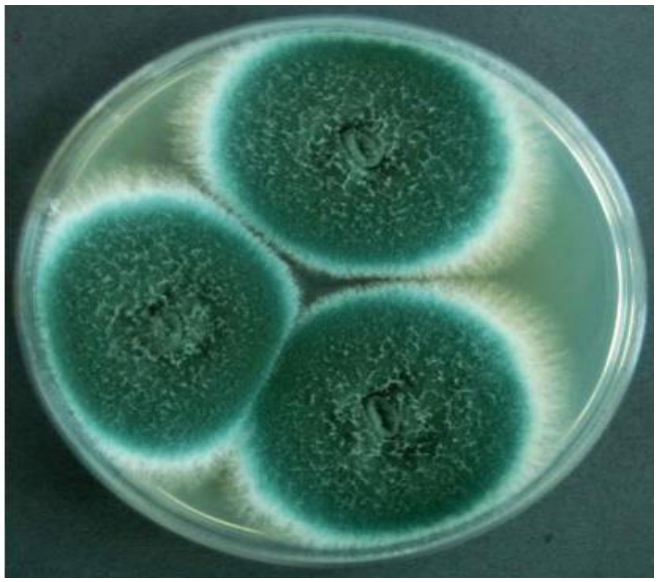
Aspergillosis is an infection, allergic reaction, or fungal growth caused by the *Aspergillus* fungus. The fungus usually grows on decaying vegetation and dead leaves. Exposure to the fungus doesn't necessarily guarantee to get aspergillosis. Almost everyone encounters the fungus on a daily basis and never contracts the illness. It's more likely to infect people with a weak immune system or a lung disease.

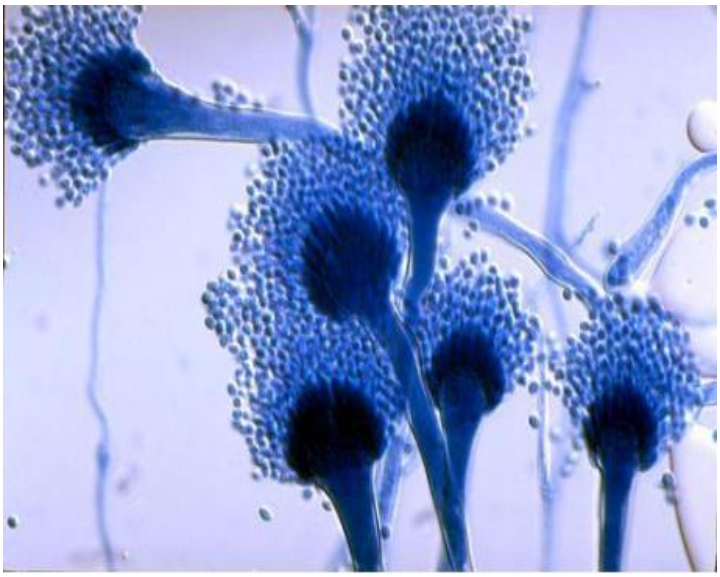


Aspergillus flavus



Aspergillus niger





Aspergillus fumigatus

What Are the Types of Aspergillosis and Their Symptoms?

Different types of aspergillosis affect the body in different ways. Certain conditions and medications increase the risk for developing each type. Different types of aspergillosis have different symptoms.

Allergic Bronchopulmonary Aspergillosis (ABPA):-

In allergic bronchopulmonary aspergillosis (ABPA), the fungus causes allergic reactions such as coughing and wheezing. The patient`s more susceptible to this type of aspergillosis if he

have lung problems such as cystic fibrosis or asthma. ABPA also causes shortness of breath, and general feelings of being unwell.

Investigation:-

Diagnosis is made on the basis of a deterioration in the patient's clinical condition (the underlying asthma or CF symptoms worsen), being a susceptible patient and the presence of the following:

- Eosinophilia.
- Positive skin test to *Aspergillus* spp.
- Elevated serum immunoglobulin E (IgE).
- Positive serology for *Aspergillus* spp.
- New infiltrates on CXR or CT scan.
- Sputum microscopy and culture may also reveal the presence of *Aspergillus* spp.

Invasive Aspergillosis:-

The more likely to have an invasive type of aspergillosis if the immune system is weakened by chemotherapy and conditions such as leukemia, cancer, and AIDS. A weakened immune system makes it more difficult to fight off infections. This type of aspergillosis invades the lung tissues and can spread to the kidneys or brain. If invasive aspergillosis goes untreated, it can cause infectious pneumonia. Infectious pneumonia can be life-threatening in people with compromised immune systems. Invasive aspergillosis often occurs in people who already have other medical conditions, so it can be hard to separate the symptoms of invasive aspergillosis from those of the other conditions. Known symptoms of invasive aspergillosis include:

- a cough (sometimes with blood)
- pain in the chest
- shortness of breath
- fever

Also, an infection of the lungs can spread throughout the body, causing new symptoms.

Investigations:-

- Invasive aspergillosis is a difficult condition to diagnose and must be specifically sought in symptomatic patients who are severely immunocompromised.
- CXR may show nodules, cavitary lesions or pulmonary infiltrates.
- CT scanning may show characteristic changes in the lungs, including the 'halo sign' (a haziness surrounding a nodule or infiltrate).

•The sputum, lung tissue from biopsy, or bronchoalveolar lavage (BAL) fluid may show the characteristic hyphae, using appropriate special stains. *Aspergillus* spp. may also be cultured from these sources.

• There is an assay to detect a component of the cell wall of Aspergillus spp., called galactomannan. This has the potential to be used as screening in those at high risk of invasive aspergillosis. Serum levels can be monitored on a regular basis.
Galactomannan can also be detected in BAL fluid. Serum galactomannan can be detected several days before the presence of clinical signs, an abnormal chest radiograph, or positive culture.

• Another fungal cell wall constituent, B-glucan, can also be detected in the serum and has a potential role in diagnosis.

• Polymerase chain reaction (PCR) techniques are also being studied to detect Aspergillus spp. in blood and BAL fluid.

• Results may be negative and empirical therapy is often started on clinical grounds in deteriorating patients.

Aspergilloma:-

The tuberculosis patient`s or another lung disease, exposure to the fungus can cause to develop a fungus growth. Also called a fungus ball, this type of growth usually consists offungus, clots, and white blood cells. The growth doesn't typically spread to other areas of the body. However, the ball can become larger and damage the lung tissues. With an aspergilloma, the patient`s may have a cough, with or without blood, and shortness of breath.

Other symptoms of different types of aspergillosis can include:

- pain in the chest and bones
- vision difficulties
- blood in urine
- less urine
- headaches
- chills
- difficulty breathing
- skin sores
- bloody phlegm

Investigations

• CXR shows a mass within a pulmonary cavity, often in the upper lobe. A crescentic outline of air may be seen to surround a solid mass.

- CT scanning can reveal the structure of the mycetoma in more detail. Supine and prone CT scans should be performed to demonstrate the mobility of the mass, which is a highly suggestive sign.
- Most show elevated serum precipitin levels to *Aspergillus* spp.