

Lecture Title: **Respiratory Fungal Infections**

(Respiratory Block, Microbiology)

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RESPIRATORY FUNGAL INFECTIONS



- Respiratory System
- Rout of infection?
- Respiratory fungal infections are less common than viral and bacterial infections.
- Invasive diseases have significant difficulties in diagnosis and treatment.

RESPIRATORY FUNGAL INFECTION - ETIOLOGY



➤ YEAST

- Candidiasis
- Cryptococcosis (*Cryptococcus neoformans*, *C. gattii*)

Opportunistic

➤ Mould fungi

- Aspergillosis (*Aspergillus* species)
- Zygomycosis (*Zygomycetes*, e.g. *Rhizopus*, *Mucor*)
- Other mould

➤ Dimorphic fungi

- *Histoplasma capsulatum*
- *Paracoccidioides brasiliensis*
- *Blastomyces dermatitidis*
- *Coccidioides immitis*

Primary infections



Primary Systemic Mycoses

- Infections of the respiratory system, (Inhalation)
- Dissemination seen in immunocompromised hosts
- Common in North America and to a lesser extent in South America. Not common in other parts of the World.

Etiologies are dimorphic fungi

In nature found in soil of restricted habitats.

Primary pathogens

They are highly infectious

They include:

Histoplasmosis,

Blastomycosis,

Coccidioidomycosis,

Paracoccidioidomycosis



Aspergillosis

Aspergillosis is a spectrum of diseases of humans and animals caused by members of the genus *Aspergillus*.

These include

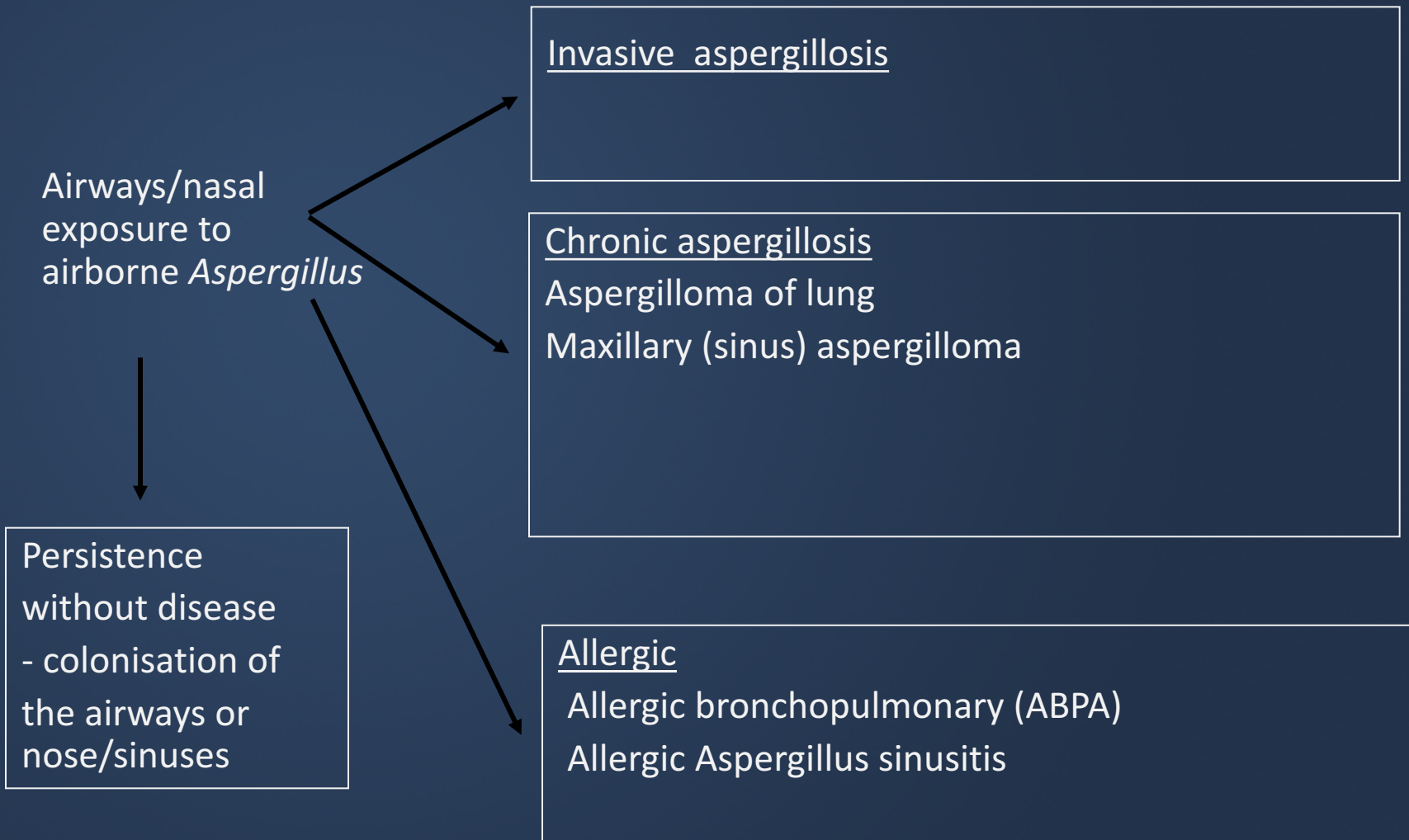
- (1) Mycotoxicosis
- (2) Allergy
- (3) Colonization (without invasion and extension) in preformed cavities
- (4) Invasive disease of lungs
- (5) Systemic and disseminated disease.

Aetiological Agents: *Aspergillus species*,

common species are:

A. fumigatus, A. flavus, A. niger, A. terreus and A. nidulans.

Classification of aspergillosis



Risk factors

- Bone marrow/ organ transplantation
- Cancer: Leukemia, lymphoma,.. etc
- AIDS
- Drugs: Cytotoxic drugs, steroids,.. etc
- Diabetes
- Others

Aspergillosis



Chronic Aspergillosis (Colonizing aspergillosis)

(Aspergilloma OR Aspergillus fungus ball)

- Signs include: Cough, hemoptysis, variable fever
- Radiology will show mass in the lung , radiolucent crescent

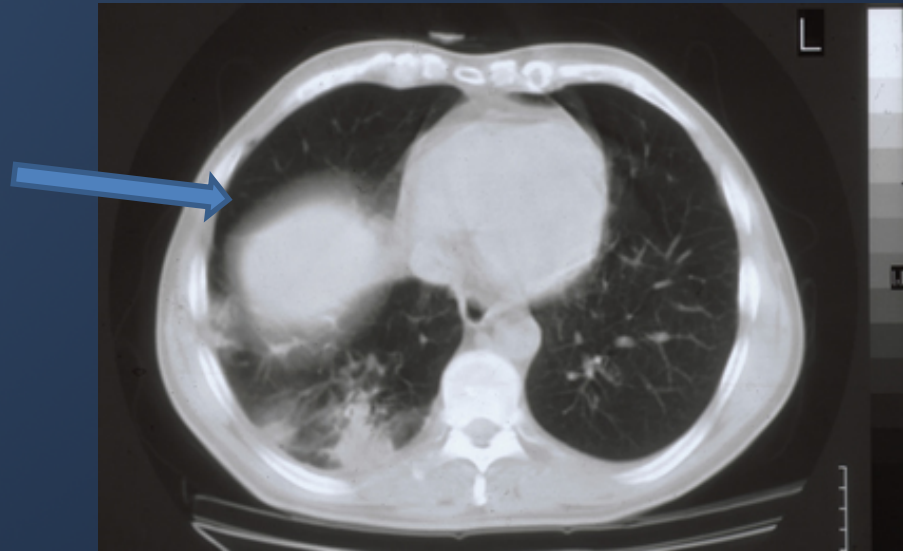
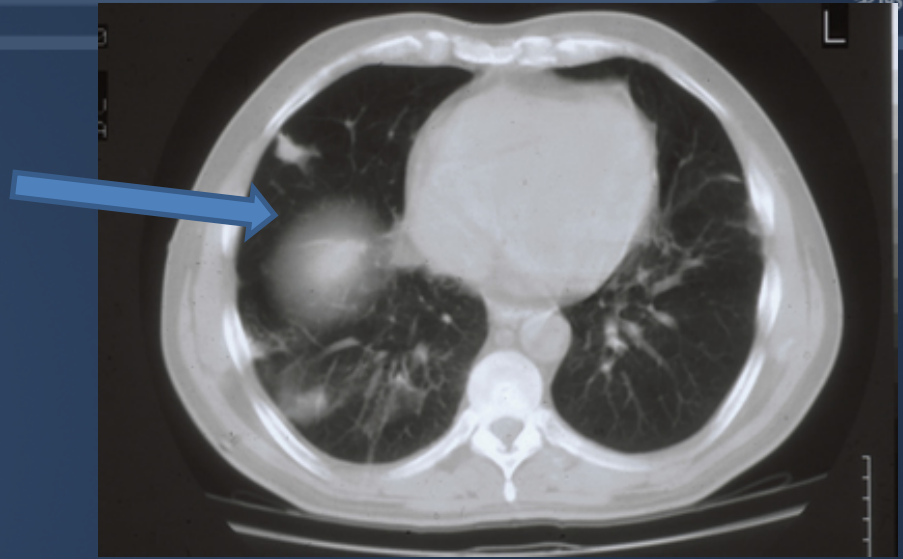
Invasive pulmonary Aspergillosis

Signs: Cough , hemoptysis, fever, Leukocytosis

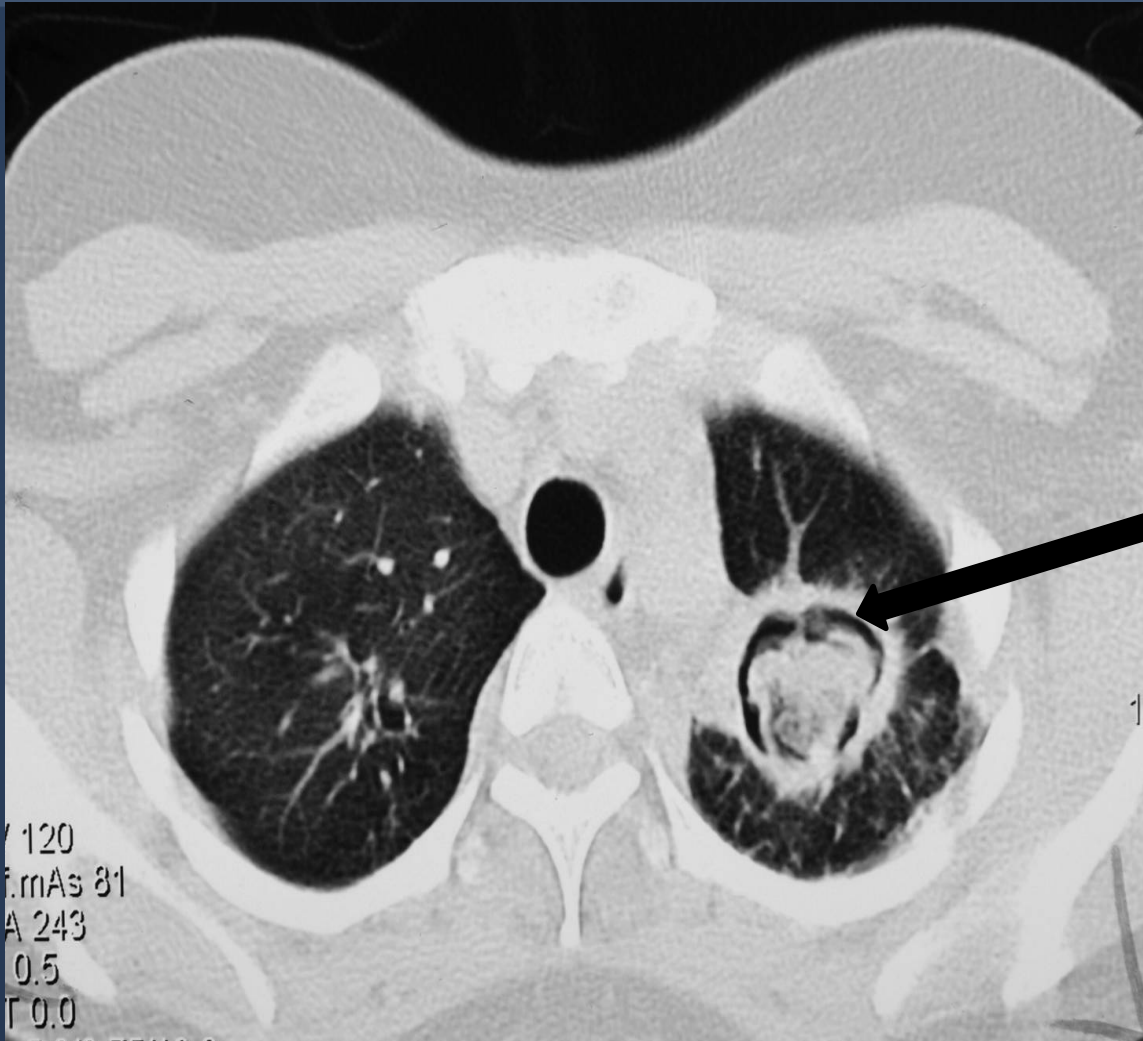
Radiology will show lesions with halo sign

Invasive pulmonary aspergillosis

Note the Halo sign



Aspergilloma



**Note the Air
crescent**

Allergic bronchopulmonary (ABPA)



- Symptoms of Asthma
- Bronchial obstruction
- Eosinophilia
- Wheezing +/-

- Also:
 - Skin test reactivity to *Aspergillus*
 - Serum antibodies to *Aspergillus*
 - Serum IgE > 1000 ng/ml

Common airborne Fungi



Aspergillus niger



Aspergillus fumigatus

FUNGAL SINUSITIS



Fungal sinusitis

Clinical:

- Nasal polyps – and other symptoms of sinusitis
- In immunocompromised, Could disseminate to – eye \implies cranium (Rhino cerebral)
- The most common cause in KSA is *Aspergillus flavus*
- In addition to *Aspergillus*, there are other fungi that can cause fungal sinusitis
- *Aspergillus* sinusitis has the same spectrum of *Aspergillus* disease in the lung

Diagnosis

- Clinical and Radiology
- Histology
- Culture

- Precipitating antibodies useful in diagnosis
- Measurement of IgE level, RAST test

Treatment : depends on the type and severity of the disease and the immunological status of the patient

Diagnosis of aspergillosis

Specimen:

- Respiratory specimens: Sputum, BAL, Lung biopsy,
- Other samples:
- Blood, etc.

Lab. Investigations:

➤ Direct Microscopy:

Giemsa Stain, Grecott methenamine silver stain (GMS)

Will show fungal septate hyphae

➤ Culture on SDA

➤ Serology:

Test for Antibody

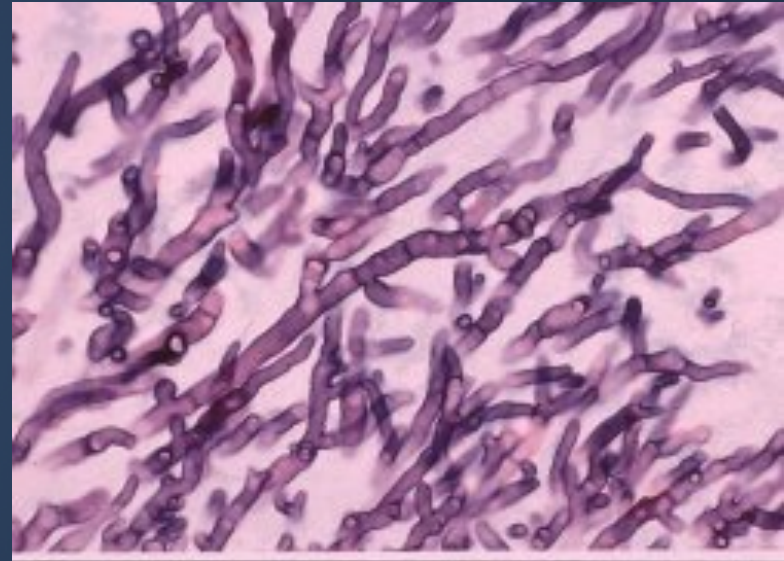
ELISA test for galactomannan Antigen

➤ PCR: Detection of Aspergillus DNA in clinical samples

Diagnosis of aspergillosis



Cultures of *Aspergillus*



Smear: Septate fungal hyphae.
Aspergillosis

Treatment of aspergillosis



➤ Voriconazole

➤ Alternative therapy

Amphotericin B, Itraconazole, Caspofungin

ZYGOMYCOSIS



- Pulmonary zygomycosis
- Rhinocerebral zygomycosis

Risk factors

- Transplant patients
- Malignancy
- AIDS
- Diabetic ketoacidosis

- Many others

Pumonary zygomycosis

- Acute
- Consolidation , nodules, cavitation, pleural effusion, hemoptysis
- Infection may extend to chest wall, diaphragm, pericardium.
 - Pulmonary infractions and hemorrhage
 - Rapid evolving clinical course

Early recognition and intervention are critical

➤ Etiology:

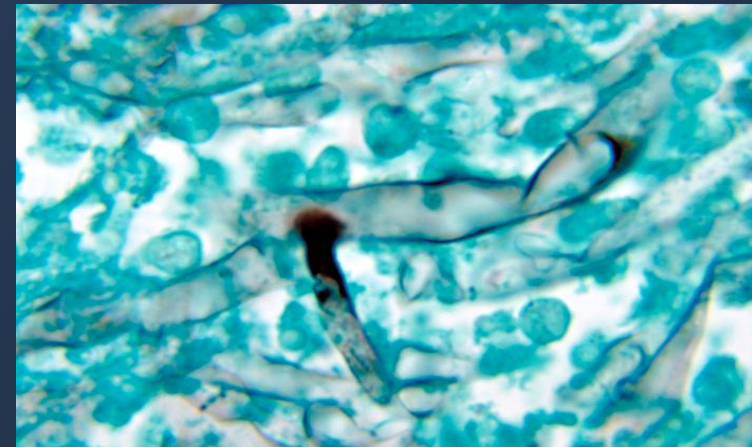
Zygomycetes , Non-septate hyphae
e.g. Rhizopus,

Diagnosis



- **Specimen:**
 - Respiratory specimens: Sputum, BAL, Lung biopsy,
 - Other samples
- **Lab. Investigations:**
 - **Direct Microscopy:**
 - Giemsa, Grecoth methenamine silver stain (GMS)
 - Will show broad non- septate fungal hyphae
 - Culture on SDA (no cycloheximide)
 - **Serology: Not available**

Treatment: Amphotericin B
Surgery



Pneumocystosis (PCP)



Pneumocystis pneumonia (PCP)

- It is interstitial pneumonia of the alveolar area.
- Affect compromised host
- Especially common in AIDS patients.

➤ **Etiology:**

Pneumocystis jiroveci

- Previously thought to be a protozoan parasite, but later it has been proven to be a fungus
- Does not grow in laboratory media e.g. SDA
- Naturally found in rodents (rats), other animals (goats, horses), Humans may contract it during childhood

Pneumocystosis

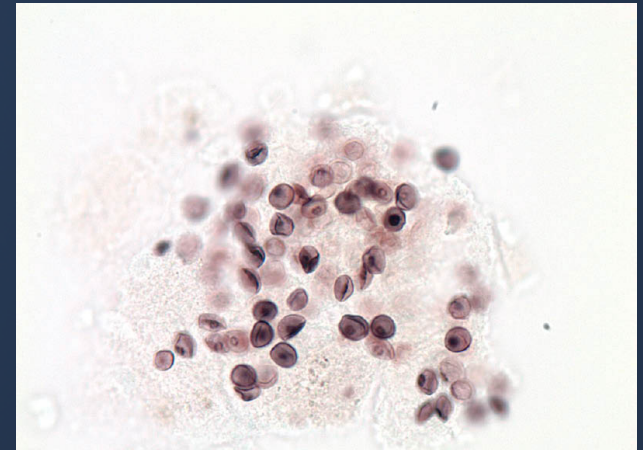
Laboratory Diagnosis:

- Patient specimen: Bronchoscopic specimens (Bronchoalveolar lavage), Sputum, Lung biopsy tissue.
- Histological sections or smears stained by GMS stain.
 - Immunofluorescence (better sensitivity)

If positive will see cysts of hat-shape, cup shape, crescent

Treatment:

Trimethoprim – sulfamethoxazole
Dapsone



Thank You 😊

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