

# **Lecture Title:** **Respiratory Fungal Infections**

(Respiratory Block, Microbiology)

**Lecturer name:**  
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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*.

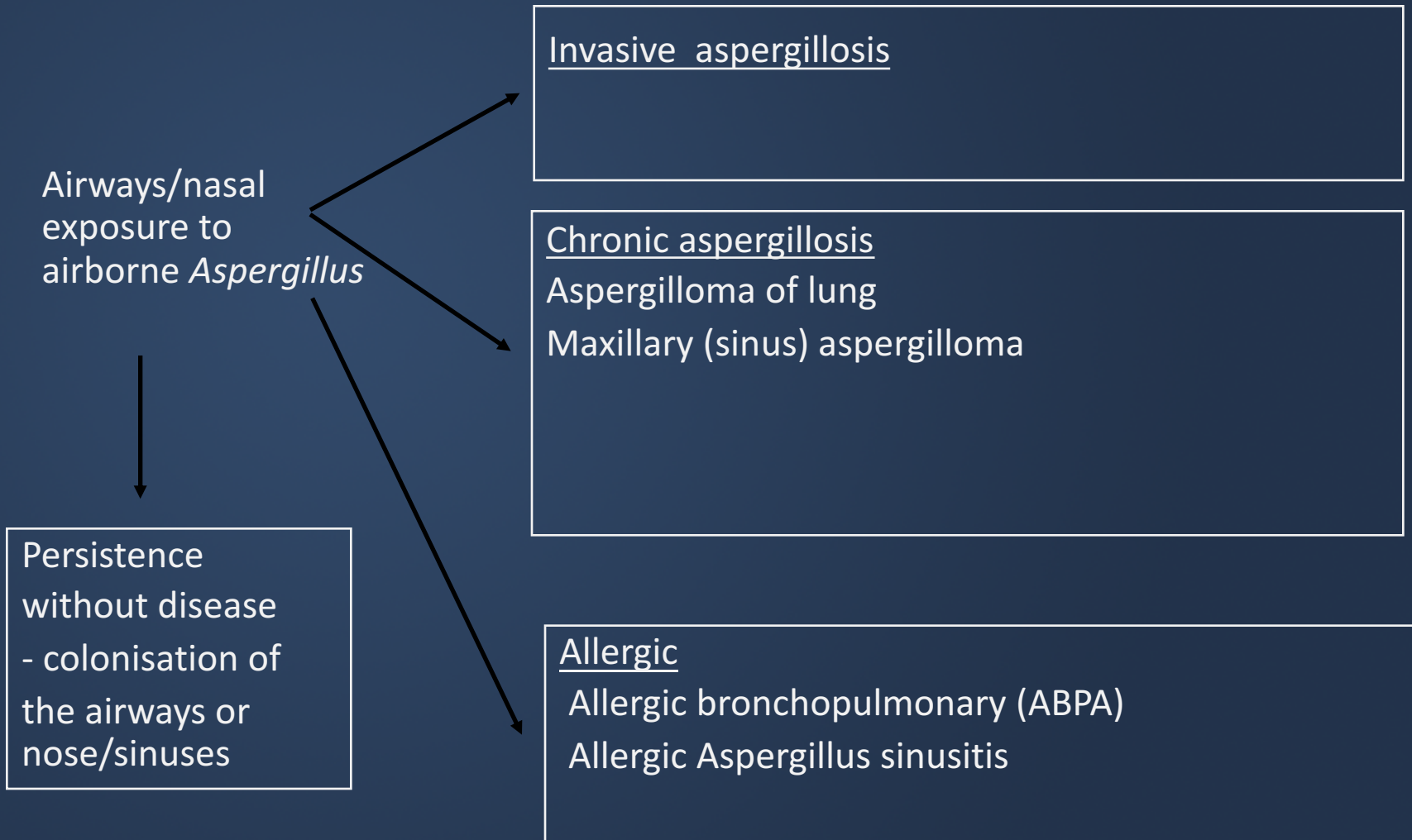
These include

- (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

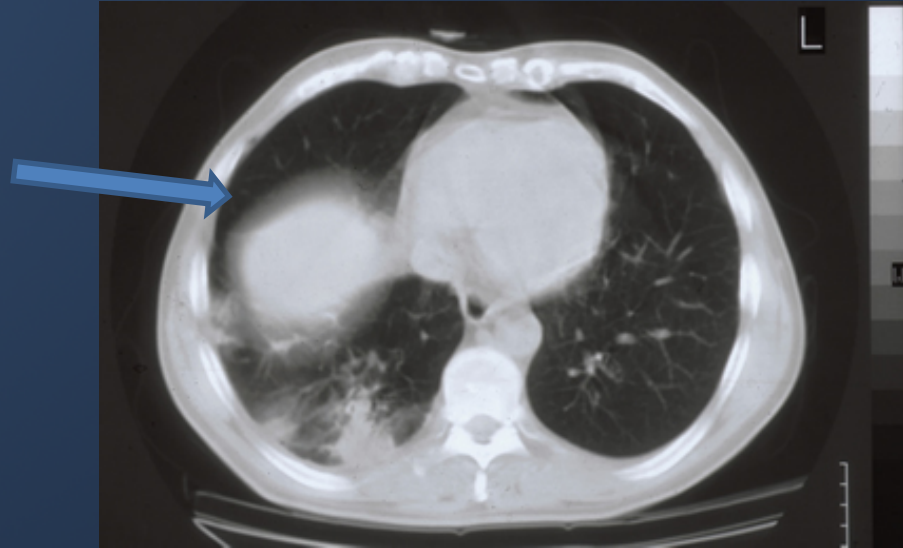
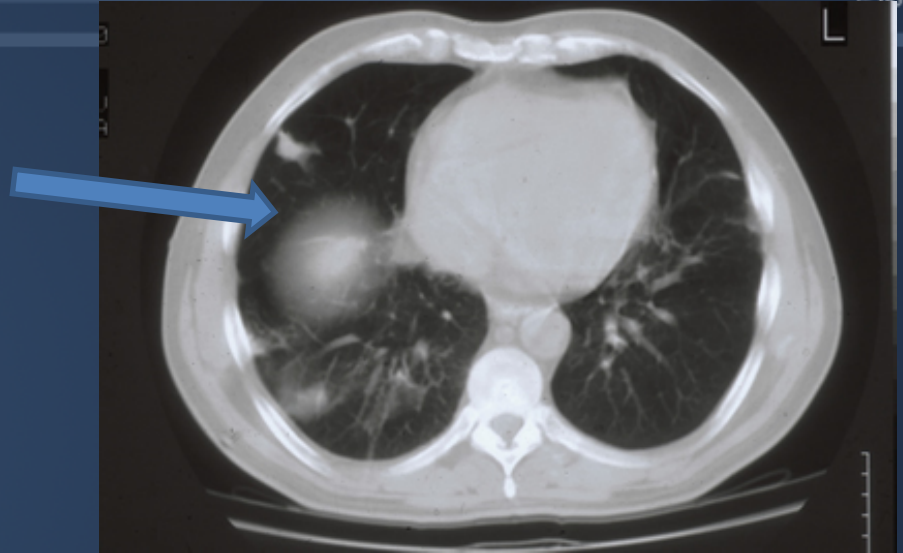
Signs: Cough , hemoptysis, fever, Leukocytosis

Radiology will show lesions with halo sign

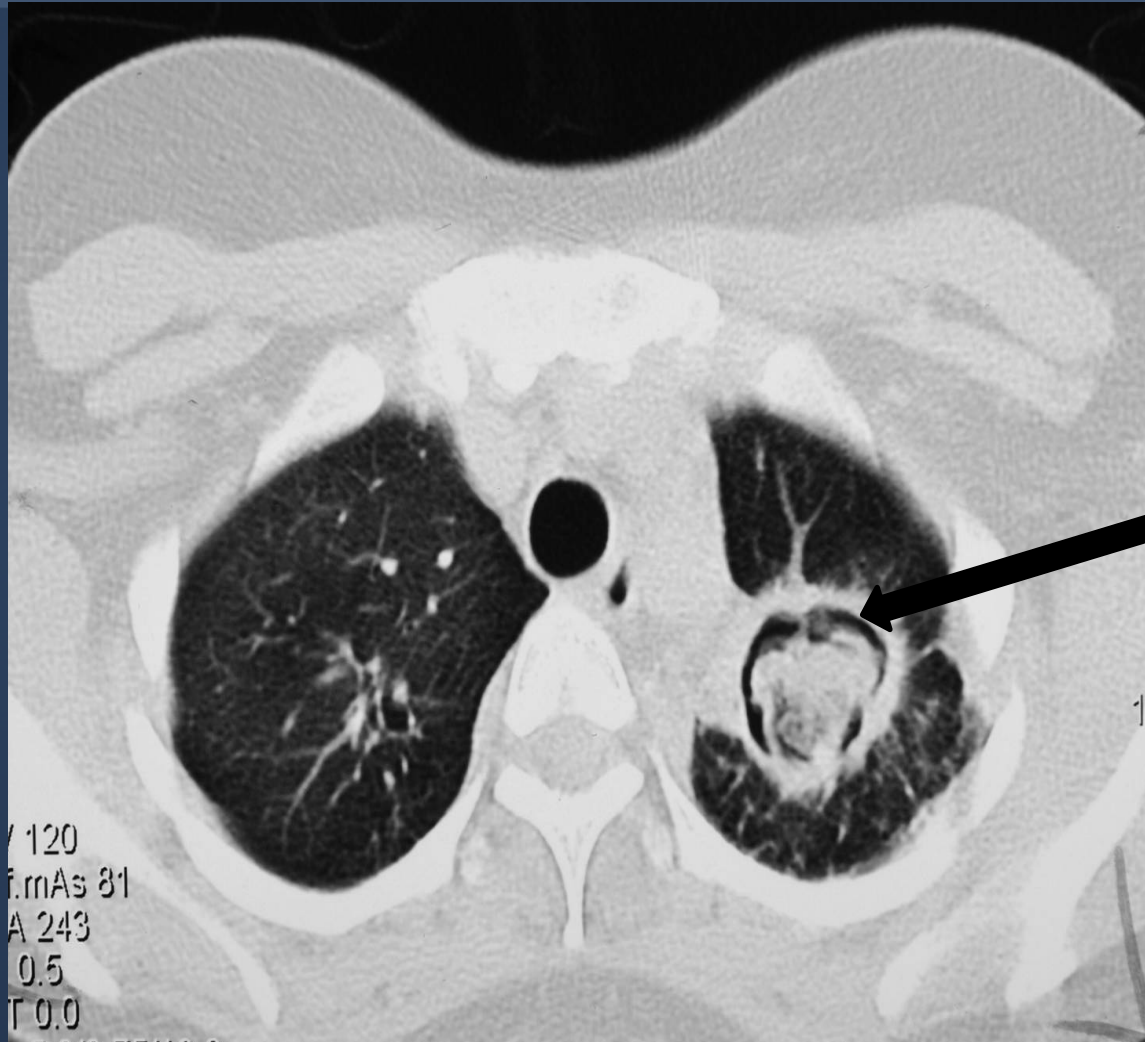


# Invasive pulmonary aspergillosis

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  $\implies$  craneum (Rhinocerebral)
- 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, Greccott methenamine silver stain (GMS)

Will show fungal septate hyphae

### ➤ Culture on SDA

### ➤ Serology:

Test for Antibody

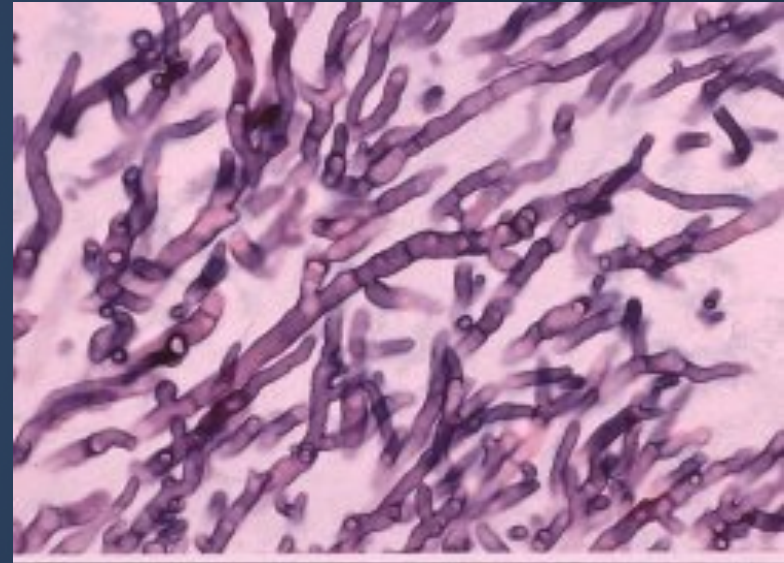
ELISA test for galactomannan Antigen

### ➤ 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:

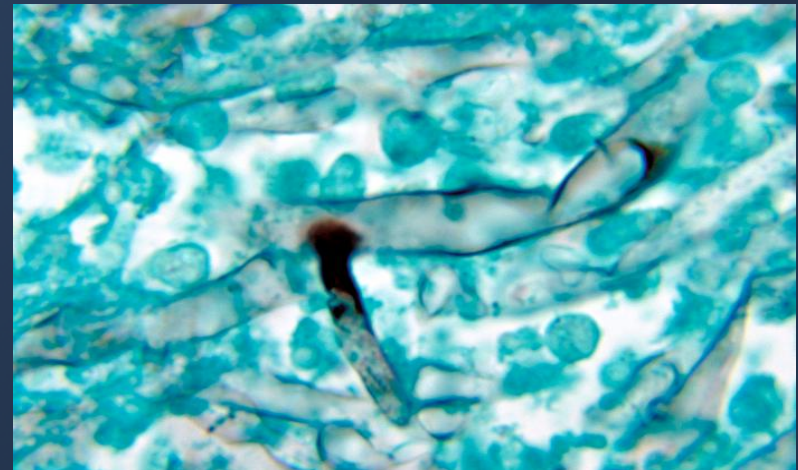
Zygomycetes , Non-septate hyphae  
e.g. Rhizopus,

# 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

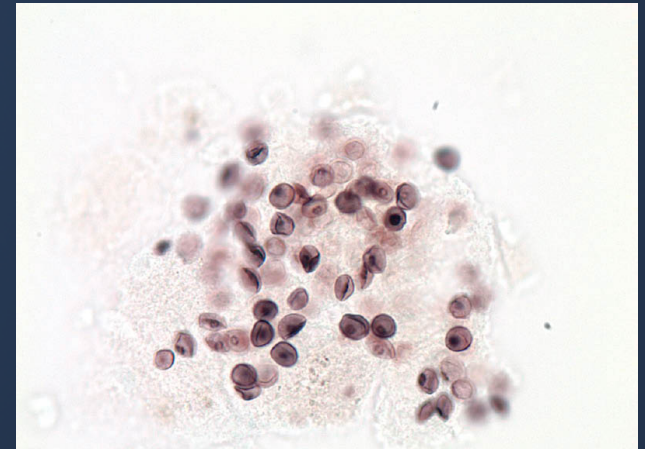
## Laboratory Diagnosis:

- 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 😊

(Respiratory Block, Microbiology)

Dr. Ahmed M. Albarrag

