MEDICAL MYCOLOGY

I. Basic Clinical Mycology of Systemic Mycoses

1. Fungi commonly causing disease.

2. Grouping of fungi causing disease.

3. Laboratory diagnosis of fungal disease.
   A. Serology
   B. Histopathology
   C. Mycology

4. Specimen collection.

5. Media for isolating fungi from clinical specimens.

6. Incubation.

7. Identification of etiological agent

II. Systemic Mycoses

1. Classical systemic mycotic diseases of the United States → cause DJ in NL indiv → DJ is predictable.
   A. Histoplasmosis
      - Histoplasma capsulatum
   B. Blastomycosis
      - Blastomyces dermatitidis
   C. Coccidioidomycosis
      - Coccidioides immitis
   * all dimorphic

2. Histoplasmosis
   * soil, esp. bird manure, or bat guano
   A. Etiologic agent: Histoplasma capsulatum
      - Mold in environ
      - Yeast in tissue
      * Inhale spores, esp. in chicken houses, etc.
      * lT-susceptible released spores & 100s get infected
      * members of attic by bats
      * There is a dose effect
B. Epidemiology: Based on skin test reactors to histoplasmin.

![Endemic Area of Histoplasmosis]

- Most common in Ky by ble of birds & caves
- Often seen in spelunkers

**Endemic Area of Histoplasmosis**

b. Age: Predominately adults
c. Race: Predominately white
d. Sex: Predominately males

C. Clinical Forms

a. **Pulmonary**: Clinically indistinguishable from other mycoses, tuberculosis and other pulmonary diseases.
   1. Acute
      - Benign—asymptomatic
      - Mild—symptomatic ➔ no fever (or little)
      - Severe ➔ need quick Tx
   2. Chronic ➔ granuloma
      - Reticular epithel. ➔ esp. tongue & skin

b. Extra-Pulmonary (Disseminated)
   - RARE in ml perf, common w/ AIDS
   - In AIDS pt, may present 1st as disseminated ➔ NOT predictable

D. Diagnosis:

a. Serology: Tests commercially available
   - Antibody produced 10-21 days
   - Tests:
     1. **Agglutination**: Quantitative, useful in acute cases ➔ for nghi (esp. acute cases)
     2. **Precipitation (Immunodiffusion)**: Qualitative, H&M bands are formed
     3. **Complement-Fixation (C-F)**: Quantitative, Titer of 1:8 or greater is significant. Antigens may cross react with other fungi.
     4. Immunofluorescence: For *H. capsulatum* antigen in urine, indicates dissemination
b. Mycology

1. Culture: Dimorphic

Mold form: On Sabouraud Agar, at 30°C, white to tan floccose colony. Slow growth, 8-21 days to form colony.

Yeast form: On enriched media, 35-37°C, white-brown yeast-like colony.

2. Microscopic Morphology:

Mold form: Septate hyphae, 5-6 μ in diameter, large (10-18μ) *tuberculated conidia* and small 4-5 μ, round, smooth-walled conidia.

Yeast form: Small yeast, 4-6 μ in diameter. Single bud with narrow septum.

3. Morphology on direct microscopic examination of clinical specimen:

Yeast form, 4-6 μ in diameter. Direct microscopy is not practical for diagnosing histoplasmosis because the yeast size is similar to other yeasts.

*Culture confirms dx.*
3. Blastomycosis:

A. Etiologic agent: *Blastomyces dermatitidis*

![Endemic Area of Blastomycosis]

B. Epidemiology: Based on cases. No skin test available.
   b. Age: Predominately adults
   c. Race: Predominately whites
   d. Sex: Predominately males

C. Clinical Forms:
   a. Pulmonary: Clinically indistinguishable from other mycoses, tuberculosis and other pulmonary diseases. *Often looks like* bacterial infection.
      Acute
      Chronic
   b. Disseminated: All organs may be involved. → can affect bone & skin

D. Diagnosis:
   a. Serology:
      1. Complement fixing antibodies may be present
      2. Precipitins may be demonstrated by I-D.
      3. High percentage of cases will be C-F and I-D negative.
      4. Cross reactions may occur with *H. capsulatum*.
   b. Mycology:
      1. Culture: Dimorphic fungus
         Mold form
         On Sabouraud agar, at 30°C, white, floccose colony.
         Yeast form:
         On enriched medium, at 35-37°C, white-brown yeast-like colonies.
         → Large budding yeast w/ large bud base.  

Remember: NOT communicable.
2. Microscopic morphology:
   Mold form: Septate hyphae, conidia 4-5 \( \mu \) in diameter, borne on slender conidiophores.
   Yeast form: Thick-walled, budding yeast, 10-15 \( \mu \) in diameter. Wide septum at bud base.
   \[\text{can't identify in this form}\]

3. Morphology on direct microscopic examination of clinical specimen: Yeast form observed.
   
   c. Histopathology: Suppurative to granulomatous; useful stains: H&E, PAS, GMS.

4. Coccidioidomycosis:
   
   A. Etiologic agent: \textit{Coccidioides immitis}
   
   B. Epidemiology: Based on skin test reactors to coccidioidin.

   \[\text{ENDEMIC AREA OF COCCIDIOIDOMYCOSIS}\]
   
   a. Geographic distribution: Desert southwest
   
   b. Age: Predominately adults
   
   c. Race: All
   
   d. Sex: Predominately males

   C. Clinical Forms: Clinically indistinguishable from other pulmonary mycoses and other pulmonary diseases.
   
   a. Pulmonary:
      
      1. Acute
         Benevolent: Asymptomatic
         Mild: Symptomatic
         Severe
      2. Chronic
   
   b. Disseminated \( \Rightarrow \text{subcutaneous (abscess)} \)
      *skin, joints, face, oral cavity*
D. Diagnosis:
   a. Serology:
      1. Antibodies detectable in 10-21 days
      2. C-F titers, 1:8 significant
      3. ID bands useful for screening
      4. Latex agglutination test useful in acute cases

   b. Mycology:
      1. Culture morphology: Dimorphic
         
         Mold form: On Sabouraud agar, 30°C, fluffy, white-tan colony.
         
         Spherule: Requires complex liquid medium or tissue culture to grow.

      2. Microscopic morphology:
         Mold form: Septate hyphae, 4-6 μ in diameter barrel-shaped arthroconidia produced
         
         Spherule: Large, 15-50 μ spherical structure containing numerous endospores
         
         Not yeast

      3. Morphology on direct microscopic examination of clinical specimens: Spherules observed.

   c. Histopathology: Suppurative to granulomatous.
      Stains: H&E, PAS, GMS.

# Tx: look in text → know where/what they react on.
   1) polyene
   2) azole