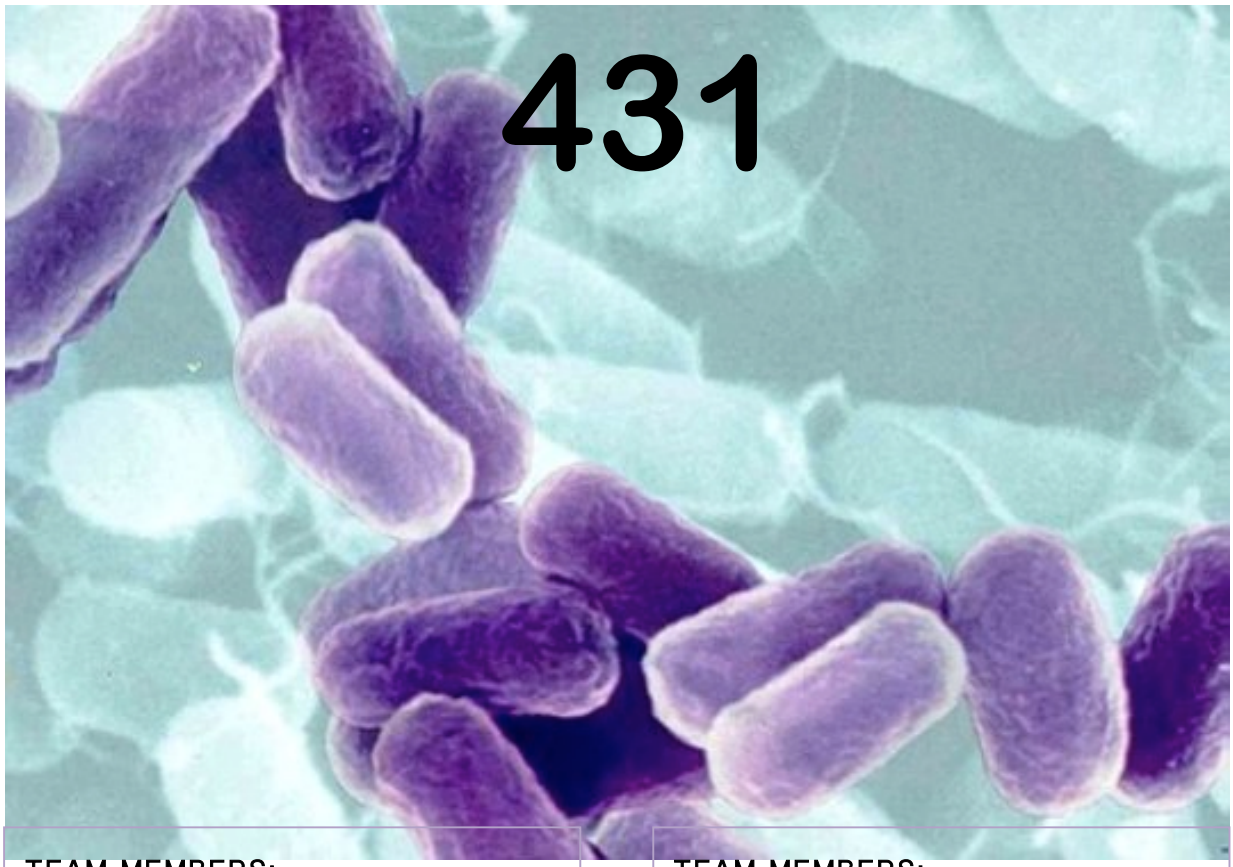
MICROBIOLOGY TEAM

431



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Respiratory Fungal Infections - part II

Dr. Ahmed Al-Barrag

- Important
- Very important
- Mentioned by the doctor but not in the slides
- For explanation only

This lecture contains the following topics:

1) Candidiasis (the main topic)

2) Cryptococcis

3) Pneumocystosis (also called Pneumocystic pneumonia: PCP)

Candidiasis

Definition:

It is the infection caused by any of the species of the genus ***Candida*** (more than 160 species).

- Candidas are **yeasts** that produce **pseudohyphae**

- Candida is the most common cause of diseases.
- ***Candida albicans*** is the most common species causing candidiasis.
- Other species include: *Candida glabrata - Candida tropicalis - Candida parapsilosis - Candida krusei*

Candida:

- It is part of the **endogenous flora** (flora that already exists on our bodies).
- Found in: 1) Skin 2) Gut 3) mucosal surfaces (mucocutaneous membranes) such as the mouth, nasal cavity, pharynx, larynx, urethra, vagina... [not the eye, but maybe in the ear].
- **Most infections** are due to a person's **own** flora (not acquired from another person or thing).
- The source for **majority** of Candida infections is **endogenous** (from person's own body)
- How do they **enter the body**? By breach in skin or mucosa by **catheters**, **trauma**, **surgery**.
- **Exogenous transmission** occurs less. It can occur during **post-surgery transmission**.

Patients at high risk to become infected with Candidiasis:

- **AIDS patients**
- Patients who have just had a **surgery**
- Patients with a **malignancy**
- Patients who have **leukopenia**
- Patients suffering from **burns**
- **Premature infants**
- Patients with **Diabetes Mellitus**
- In general: Immunocomprimised patients

Exposures that increase the risk of being infected with Candidiasis:

- Staying at **ICU (intensive care unit)** for more than 7 days because of many intubations and catheters.
- **CVCs** (central venous catheters)
- Use of **antibiotics** especially those with wide spectrum because they kill the bacteria of body's normal flora and this allows fungi (which can't be killed by antibiotics) to stay and colonize → this causes Candidiasis.
- **TPN** (total parenteral nutrition) through lines. Line is connected directly to a vein and it's used to supply nutrition to patients who can't eat because of troubles in GIT.

- Candidiasis has a very **wide and broad spectrum**; it can affect any place in the body. Infection occurs when a risk factor becomes available.

Candidiasis Spectrum:

Candidiasis can affect these organs:

- **Skin and nail**
- **Gastrointestinal Tract** (oral cavity, esophagus)
- **Genitalia** (female) [mycotic vaginitis]
- Lower & upper **urinary tract**
- **Eyes** (ocular infections) (Keratitis, endophthalmitis)
- **Bloodstream**. This causes Candidemia: colonization of candida in the bloodstream. Can disseminate and go to CNS, lung or spleen.
- **CNS** Candida in CNS can cause **meningitis**
- **Deep organ** Candidiasis
- **Lungs**. It can cause pneumonia.
- **The heart**. It can cause endocarditis
- **Bones and joints** such as osteomyelitis
- **Mucocutaneous membranes**. Causes Chronic Mucocutaneous Candisiasis (CMC): congenital therefore it's found in children, immunological defect in immune system, specifically IL-17. Candidiasis causes legions.

Mucocutaneous & cutaneous Candida infections:

- **Oral Thrush:** **White or grey** pseudomembranous **patches** on oral surfaces, especially the tongue, with underlying erythema (redness or rash).
  Common in: neonates, infants, children, elderly , **AIDS patients** , immunocomprimised hosts.
- Esophagitis
- Diaper Rash very common in children

Pulmonary Candidiasis:

- **Primary pneumonia** is **less common** and could be a result of **aspiration** (when acidic contents of the stomach go to the lungs because of a GIT problem.
- **Secondary pneumonia** is commonly seen in patients with hematogenous candidiasis (candidemia) and immunocomprimised patients.

- **Diagnosis:**
  - ☒ Clinical features
  - ☒ Radiology
  - ☒ Reaction to antibiotic: If there's response to antibiotic then the infection is bacterial and it's not fungal. If **there is NO RESPONSE** to antibiotics, then the infection is fungal and could be candidiasis.
  - ☒ **Isolation of Candida** from sputum or BAL (bronchioalveolar lavage: fluid inserted in lungs and then recollected through bronchoscope) is **NOT ALWAYS SIGNIFICANT**.
    The reason: because it can get contaminated with normal flora from oral cavity.

- Other yeasts causing pulmonary infections: (not candida)
  - ☒ Trichosporon
  - ☒ Geotichum

Candidemia:

- Candidemia is a form of septicemia. Septicemia is the colonization of a microorganism in **blood**.
- It is the increased colonization of Candida (endogenous or exogenous factors. Exogenous factors such as from the nurse or from contaminated tools in a hospital)
- Candida reaches blood after: **Damage in host barrier** by: **catheters**, **trauma**, **surgery**
- The chance of getting infected increases in: immunocomprimised patients (with malignancy, diabetic...etc)
- CVC (central venous catheters) this is called catheter related candidemia

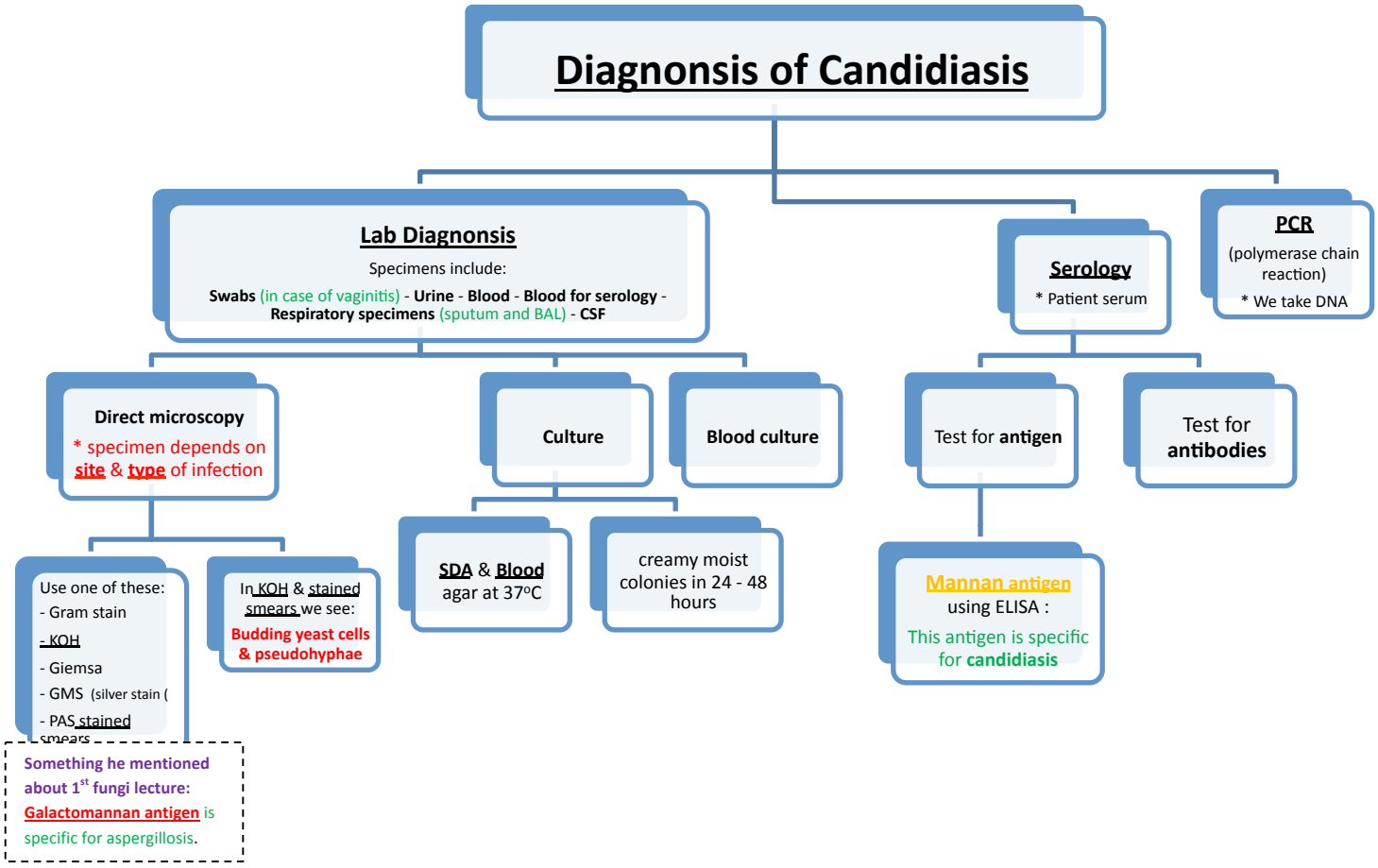
- Candidemia can spread to other organs, this is called dissemination candidiasis and it can cause:
  - ☒ Septic shock
  - ☒ Meningitis
  - ☒ Ocular involvement (very common in candidiasis)

- **Clinical presentation: FEVER + NO RESPONSE TO ANTIBIOTICS.** We must do blood culture for diagnosis.

Candidemia – Nosocomial Bloodstream Infection:

- Candida is the **FOURTH** in causing **nosocomial bloodsteam infections (BSI).**
- Mortality in ICU is higher than mortality in non-ICU.

Diagnosis of Candidiasis:



- **Candida Albicans** is the most common species of candida to cause infection. Therefore, we do the **following tests** to identify this species (C. Albicans) :
  1. Germ tube test: Formation of germ tube when cultured in serum at 37C. Other fungi produce budding yeasts, and they don't produce germ tubes like C.Albicans.
  2. In corn meal Agar (CMA) it produces chlamydospore.
  3. Resistance to 500 µg/ml Cycloheximide

- If these 3 tests are **positive**, then the yeast **is Candida albicans**

- If **negative**, then it could be any **other yeast,** and we need more tests to identify the species:
    1. Use ***Carbohydrate assimilations and fermentation** (to see if species ferment sugar aerobically or anaerobically)
       ***this test can identify any type of fungi**
    2. Commercial kits available for this, like: API 20C, API 32C

- Culture on Chromogenic Media (CHROMagar™ Candida) each species produce a unique different color on this agar.

Treatment of Candidiasis

- **Oropharyngeal:** Topical agents (Miconazole, Clotrimazole troches, topical Nystatin suspension, Fluconazole suspension)
- **Vaginitis:** Topical agents (Miconazole, Clotrimazole)
- **Systemic e.g. candidemia:** (Fluconazole, Voriconazole, Amphotericin) and we treat for 14 days with **removing catheters**, if possible

but **C. Krusei and C. glabrata are RESISTENT to fluconazole, especially C. Krusei**

If a sterile sample is found to contain fungi, if the infection is recurrent or the patient is not responding we do **Antifungal susceptibility testing.**

Pulmonary Cryptococcosis

- Causative agent: yeast with a thick capsule for e.g. : Cryptococcus neoformans and Cryptococcus gattii
- Source of infection: From birds' droppings & contaminated soil, humans get infected by inhalation.
- **In the normal person**: the infection could be asymptomatic
- **In immune-compromised person:** may develop pneumonia, disseminate to CNS causing **meningitis**, but sometimes the first site of infection is the CNS.

Lab tests

- **Samples:** Respiratory sample and If meningitis is developed, collect a CSF sample
- **Direct microscopy** by silver stain (GMS), or Giemsa stain. If CSF sample then do **India Ink preparation**
- If positive we see **yeast cell with a thick capsule**
- **Culture on SDA medium**
- **Identify using API 20C**
- **Urease and Phenol oxidase will be positive**

Treatment: Amphotericin B or combination of amphotericin B with flucytosine

Pneumocystosis (PCP)

Etiology: ***Pneumocystis jiroveci,*** which was previously thought to be a parasite, but it has been proven to be a **fungus**.

- This fungi causes opportunistic fungal pneumonia**. It is especially common in AIDS patients.**

Lab tests

- **Sample:** you better collect bronchoscopic specimens: B.A.L, Sputum, Lung biopsy tissue.
- Diagnosis is based on microscopic examination only, **not culturing because it doesn't grow in lab media**.
- We stain by GMS (silver stain), If positive we will see **cysts.**
- We can use also Immunuofluorescence (better sensitivity)

Treatment is not by antifungal agents but with Trimethoprim – sulfamethoxazole Dapsone.

Questions:

1.The most common fungus to cause infections is:

A.aspergellos
B.Candida
C.pneumocystis jiroveci
D.All of the above

2.which of the following is most likely to be seen in AIDS patients:

A.Pneumocstosis
B.Candidiasis infection
C.Oral Thrush
D.All of the above

3.when using direct microscopy for candidiasis, the specemen depends on:

A.Size of candida
B.Site of infection
C.Type of infection
D.Site and Type of infection

4. the best way to investigate pneumocystis jiroveci:

A.Culture
B.Gram Stain
C.IF microscopy
D.Clinical presentation

Answers:

1.B
2.D
3.D
4.C