

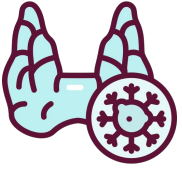


TEAM 443
MICROBIOLOGY

Candidiasis

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OBJECTIVES

- 1 Acquire the basic knowledge about Candida as a pathogen
- 2 Know the main infections caused by Candida species
- 3 Identify the clinical settings of such infections
- 4 Know the laboratory diagnosis, and treatment of these infections

اللهم إنا نسألك حُسن الصيام وحُسن الختام، ولا تجعلنا من
الخاسرين في رمضان، اللهم إجعلنا ممن تدركهم الرحمة ثم
المغفرة ثم العتق من النار

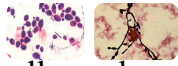



Candida & Candidiasis

Candida

- ▶ Candida is a unicellular yeast fungus. It is imperfect reproducing by budding.
- ▶ **Candida is the most common pathogen of fungal infections.**

Morphology

- ▶ **Microscopy:**  Budding yeast cells, and pseudohyphae.
- ▶ **Culture:**  **Creamy colony**, fast growing on Sabouraud Dextrose Agar **(SDA)**, **Blood agar** (48 hr).

Species

- ▶ There are many species of Candida (>150).
- ▶ The common species are:
 - ➔ Candida albicans (most common)
 - ➔ C.parapsilosis
 - ➔ C.tropicalis
 - ➔ C.glabrata
 - ➔ C.krusei

Human Commensal

- ▶ Candida is commonly found in various parts of the body **as a part of normal flora**, including:
 - ➔ Oral cavity
 - ➔ Skin
 - ➔ Gastrointestinal tract
 - ➔ Genitourinary tracts

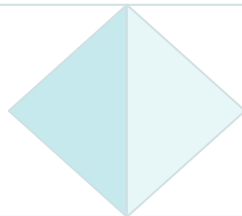
Candidiasis

- ❖ Candidiasis is any infection caused by any species of the yeast fungus Candida.
- ❖ It is the most common fungi causing **infections in immunocompromised patients**.
- ❖ It is the **4th most common** cause of nosocomial bloodstream infection.

Candidiasis is considered an opportunistic fungal infection, caused by either:

Alteration in the:

- ▶ **Immunity** : eg **AIDS**
- ▶ Normal Physiology
- ▶ Normal Flora



Damage in the:

- ▶ **Barriers**, such as the skin and mucous membranes, that help prevent infections and diseases. **by surgery or trauma**

Mode of Transmission include:

1

Endogenous;

- ▶ Colonization precedes infection.
- ▶ Antibiotic suppression of normal flora, fungal overgrowth.

2

Exogenous

Very rare



Mucous Membrane Infections




Clinical Spectrum of Diseases

Mucous Membrane Infections

Cutaneous Infections

Other Infections

Mucosal / Mucous Membrane Infections

Oropharyngeal / Oral Candidiasis “Oral Thrush”	<ul style="list-style-type: none"> ▶ White or grey pseudomembranous patches on oral surfaces especially tongue with underlying erythema. ▶ Common in neonates, infants, elderly, Who uses broad antibiotics for a long time ▶ Common in immunocompromised host, e.g. AIDS. 
Esophagitis	White lesions on the lining of your esophagus that may look like cottage cheese and may bleed if they're scraped.
Vulvovaginitis / Vaginitis	<ul style="list-style-type: none"> ▶ Thick discharge, itching irritation. Lesion appear as white patches on vaginal mucosa. ▶ Common in pregnancy, diabetics, use of contraceptives.

Forms of oral candidiasis include:

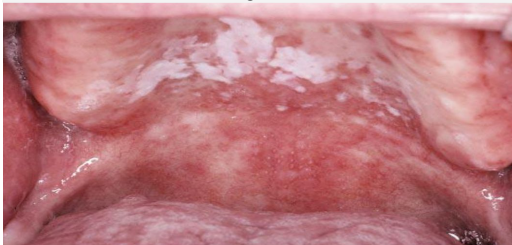
Pseudomembranous Form



Erythematous Form



Pseudomembranous-Erythematous Form



Hyperplastic Candidiasis
that was mistaken for Leukoplakia








Cutaneous and Other Infections

Mucous Membrane Infections

Cutaneous Infections

Other Infections

Cutaneous Infections

<p>Intertriginous Candidiasis</p>	<ul style="list-style-type: none"> ▸ Infections of skin folds eg. axilla, buttock, toe web, under breast. ▸ Erythematous lesion, dry or moist or whitish accompanied by itching and burning. 	
<p>Nail Infections</p>	<ul style="list-style-type: none"> ▸ Paronychia (skin around nail bed): This is an infection of the skin around the nail bed, which can cause redness, swelling, and pain. ▸ Onychomycosis (nails): Candida can infect the nails, causing them to become thickened, discolored, and brittle. 	
<p>Diaper Rash</p>	<p>Candida can thrive in moist environments, leading to a rash in the diaper area of infants.</p>	
<p>Chronic Mucocutaneous Candidiasis</p>	<ul style="list-style-type: none"> ▸ This is a rare condition characterized by persistent or recurrent infections of the skin, nails, and mucous membranes. ▸ It is often seen in children with T-cell abnormalities, which are a type of immune system dysfunction. 	

Mucous Membrane Infections

Cutaneous Infections

Other Infections

Other Infections

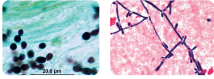

<p>Urinary Tract Infection</p>	<p>Candida can infect the urinary tract, leading to urinary symptoms.</p>	
<p>Pulmonary Candidiasis</p>	<ul style="list-style-type: none"> ▸ Primary pneumonia is less common and could be a result of aspiration ▸ Secondary pneumonia commonly seen with hematogenous candidiasis ▸ Isolation of Candida from sputum or bronchoalveolar lavage (BAL) is not always significant and may require clinical correlation with clinical features, radiology, and other lab investigations. 	
<p>Candidemia & Disseminated Infection (systemic, invasive)</p>	<p>Definition: This is a severe form of candidiasis where the infection spreads from the initial site to the blood & organs. It can affect various organs, including:</p> <ul style="list-style-type: none"> ◦ Endophthalmitis (eye) ◦ Liver ◦ Spleen ◦ Kidneys ◦ Skin ◦ Brain ◦ Bone ◦ Lungs <p>Epidemiology: Candida is the 4th in causing nosocomial bloodstream infections (BSI).</p> <p>Pathogenesis of candidemia “How does this pathogen reach the blood?”:</p> <ul style="list-style-type: none"> ▸ Increased colonization (endogenous or exogenous factors) ▸ Damage in host barriers by catheters, trauma, surgery ▸ Immunosuppression ▸ Central venous catheters (CVC) <p>Complication: Disseminated candidiasis (involvement of any organ) can cause:</p> <ul style="list-style-type: none"> ▸ Septic shock ▸ Meningitis ▸ Ocular involvement (retinitis) <p>Clinical manifestation: Fever could be the ONLY clinical manifestation.</p>	

Rank	Pathogen	% BSI			% Crude Mortality	
		Total	ICU	Non-ICU	Total	ICU
1	Candida	15.8	21.2	22.9	26.8	22.7
2	Pseudomonas	15.3	20.3	18.6	23.7	24.4
3	Enterobacter	4.8	8.4	8.8	33.9	43.8
4	Candida spp.	4.6	8.0	10.1	7.8	29.2
5	Coagulase negative staphylococci	2.6	5.4	3.7	7.4	23.8
6	Acinetobacter	2.4	4.8	4.8	5.5	27.6
7	Staphylococcus aureus	2.1	4.2	4.7	3.8	30.7
8	Enterococcus	1.9	3.8	4.7	3.1	26.7
9	Streptococcus	0.9	1.7	2.1	1.3	27.4
10	Atypic gram-negative	0.6	1.2	1.6	0.9	36.8



Laboratory Diagnosis

Lab diagnosis methods to detect the presence of Candida:

Specimen: depend on site of infection. Swabs, Urine, Blood, Respiratory specimens, CSF, Blood	
Direct microscopy	<ul style="list-style-type: none"> ▶ Gram stain, KOH, Giemsa, GMS, or PAS stained smears. ▶ Stained smear or KOH: will show budding yeast cells and pseudohyphae 
Media Culture	<ul style="list-style-type: none"> ▶ Media: SDA & Blood agar at 37°C, Creamy moist colonies in 24-48 hours. ▶ C. Albican in Sabouraud Agar (SDA) will show Creamy white yeast, may be dull, dry irregular and heaped up, glabrous and tough 
Blood culture	<ul style="list-style-type: none"> ▶ Uses: Detection of circulating microorganisms in septicaemia (blood) ▶ Description: Different types of blood culture bottles and blood volumes required. <ul style="list-style-type: none"> ▫ Paediatric aerobic (0.5-4 mL blood) ▫ Adult aerobic & Anaerobic (5-10 mL blood) ▶ Two sets of cultures before starting antibiotics is ideal
Serology	<p>Specimen: Patient serum</p> <ul style="list-style-type: none"> ▶ Test for Antigen, e.g. Mannan antigen using ELISA ▶ Test for Antibodies
PCR	Detection of candida DNA in the blood, pcr is very specific and sensitive and is promising in diagnosing candidiasis

SDA = Sabouraud dextrose agar

Lab diagnosis methods to detect the presence of Candida Albicans specifically

★ **Candida Albicans it's the most common species to cause infection:**

<p>Germ tube test Formation of germ tube when cultured in serum at 37°C</p> 	<p>Corn meal Agar Chlamydospore production</p> 	<p>Cycloheximide C. Albican will show resistance to 500µg/ml of Cycloheximide</p>
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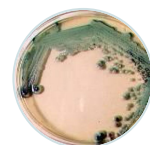
If the above 3 test are +ve this yeast is C.albicans



If -ve, then it could be any other yeast

Other tests that are used to differentiate between different species of Candida

<ul style="list-style-type: none"> ▶ Carbohydrate assimilations and fermentation. ▶ Commercial kits available for this like: API 20C, API 32C
<ul style="list-style-type: none"> ▶ Culture on Chromogenic Media (CHROMagar™ Candida): ▶ Chromagar producing green pigmented colonies on specially designed medium to speciate certain yeasts based on color they produce
<ul style="list-style-type: none"> ▶ Automated system: e.g. MALDI-TOF (Matrix Assisted Laser Desorption Ionization Time-Of-Flight)





Treatment

Oropharyngeal

- Topical Nystatin suspension
- Clotrimazole troches
- Miconazole
- Fluconazole suspension

Vaginitis

- Miconazole
- Clotrimazole
- Fluconazole

Systemic

- Fluconazole
- Voriconazole
- Caspofungin
- Amphotericin

In candidemia:

- ◎ Treat for 14 days after last negative culture and resolution of signs and symptoms
- ◎ Remove the source of infection if possible, e.g.: catheters

Treatment

- We usually use topical agents to treat skin, oral thrush and so on
- In AIDS and invasive diseases we will use systemic treatments
- In general, we will start with caspofungin when we detect a Candida infection because it is broad spectrum, and once *C. albicans* or another species is detected except of *C. krusei* and *C. glabrata*, we will continue with fluconazole.

Antifungal susceptibility testing is not done routinely in the microbiology lab. It is done in the following cases:

- ★ For fungi isolated from sterile samples
- ★ If the patient is not responding to treatment
- ★ In case of recurrent infections

Points to consider:

1

C. glabrata can be less susceptible or resistant to fluconazole

2

C. krusei is resistant to fluconazole



MCQs

Q1 - Which of the following candida is resistant to fluconazole?			
A. <i>C. albicans</i>	B. <i>C. parapsilosis</i>	C. <i>C. tropicalis</i>	D. <i>C. krusei</i>
Q2 - Which of the following tests can be used to differentiate between types of the candida?			
A. Chlamydia spores	B. Carbohydrate assimilation	C. Germ tube test	D. Urease test
Q3 - Which of the following is used to differentiate candida albican from other yeast?			
A. Coagulase test	B. Urease test	C. Germ tube test	-
Q4 - A One-month newborn came to the pediatric clinic with white plaques in the back of his tongue and his soft palate. His doctor diagnosed him and prescribed for him Nystatin. Which one of the following is the presenting problem of the newborn?			
A. Oral thrush	B. Esophagitis	C. Intertriginous Candidiasis	D. Chronic Mucocutaneous Candidiasis
Q5 - A patient developed Candidemia. The causative specie is not determined yet. Which of the following is the best option for treatment at the moment?			
A. Nystatin	B. Caspofungin	C. Fluconazol	D. Clotrimazol
Q6 - Upon examination of a three months old infant, you found white pseudomembranous patches on the surface of his tongue with erythema. Which of the following is a suitable treatment?			
A. Penicillin	B. Cephalosporin	C. Miconazole	D. Quinine

A1. D A2. B A3. C A4. A A5. B A6. C



TEAM 443
MICROBIOLOGY

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Any future corrections will be in the editing
file, so please check it frequently

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