Respiratory Fungal Infections-II

Dr. Ahmed Al-Barrag

Asst. Professor of Medical Mycology
School of Medicine and the University Hospitals
King Saud University

Candidiasis

Candidiasis refer to infection caused by any of the > 160 species of the genus *Candida*

Candida

Yeasts

Pseudohyphae

Candida albicans. is commonly responsible for candidiasis

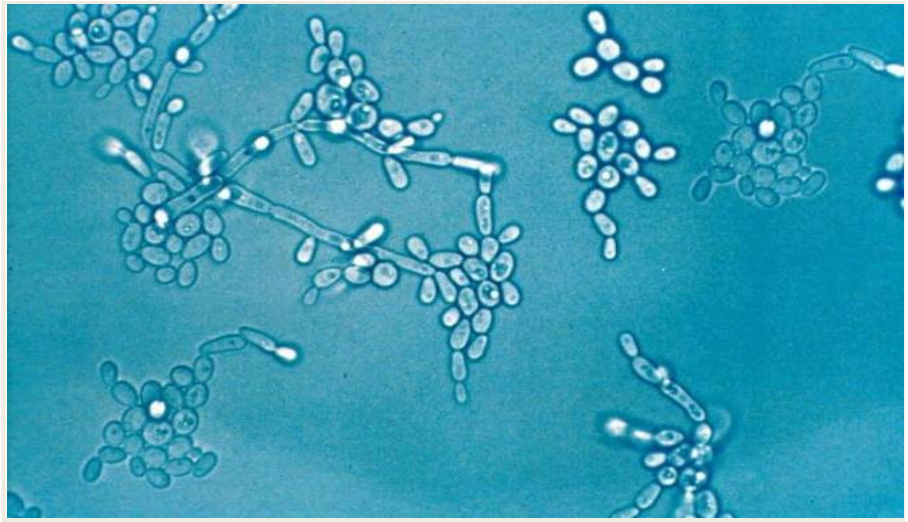
:Other species include

,Candida glabrata

,Candida tropicalis

,Candida parapsilosis

Candida krusei



Candida

Part of the endogenous flora
Skin
Gut
Mucosal surfaces

Most infections are due to person's own flora

:Portal of entry
Breach in skin or mucosa by catheters, trauma, surgery

Endogenous source for majority of Candida infections
?Exogenous transmission

Candidiasis

High-risk patients

AIDS

Surgery

Malignancy

Leukopenia

Burns

Premature infants

xposures

ICU ≥7 days
CVCs
Antibiotics
TPN
Colonization

Candidiasis

isease spectrum

- Infections of the skin and nail
- Gastrointestinal infections (oral cavity, esophagus)
- Infection of genitalia (female)
- Urinary tract infection (lower and upper UTIs)
- Ocular infections (Keratitis, endophthalmitis)

- Candidemia
- CNS infection

- Deep organ Candidiasis
- Pneumonia
- Endocarditis
- Bone and joint infections
- Chronic mucocutaneous candisiasis (CMC) (congenital, immunological defect)

Candidiasis

Mucocutaneous & Cutaneous infections

:Oral thrush

White or grey Pseudomembranous patches on oral surfaces especially .tongue with underlying erythema

,Common in neonates, infants, children, elderly

.compromised host, AIDS

Esophagitis

Diaper rash

Pulmonary Candidiasis

Primary pneumonia is less common and could be a result of Aspiration

Secondary pneumonia commonly seen with hematogenous candisiasis
Immunocompromised patients

:Diagnosis
Isolation of *Candida* from sputum, BAL is not always significant
Radiology, clinical features

Lung biopsy

Other yeast causing Pulmonary infections
Trichosporon
Geotrichum

Urinary Tract Infections

Risk factors
- **Diabetes mellitus**
- **Antibiotics**
- **Indwelling urinary catheters**
- **Other risk factors**
  - **Extremes of age**
  - **Immunosuppressive agents**
  - **Interruption of the flow of urine**

Asymptomatic UTI
Ascending infection
- **Invasive cystitis**
- **Pyelonephritis**
- **Fungus ball**

Hematogenous spread (Invasive candidiasis/candidemia)

Candiduria as sign of invasive candidiasis/candidemia

Diagnosis :
- **Candiduria significance? Contamination, colonization or infection?**
- **Colony count (10^5 cfu/ml or $> 10^3$ cfu/ml)**
- **Repeated cultures**
- **Pyuria (no catheter)**

Vulvovaginal candidiasis

Vaginal yeast infections
More frequently in women who are

pregnant
uncontrolled diabetic
taking birth control pills
taking antibiotics or corticosteroids
use an IUD
have AIDS

.of all women get a vaginal yeast infection at least once 75%
In 50-60% of the cases, is caused by *Candida albicans*

Treatment

By the application of medicated gels, creams, or suppositories applied directly to the vagina
Miconazole or clotrimazole

OR oral fluconazole

Candidemia

(Increased colonization (endogenous or exogenous factors
Damage in host barriers by catheters, trauma, surgery
Immunosuppression

(Central venous catheters (CVC

(Disseminated candidiasis (envolment of any organ
Septic shock
Meningitis
(Ocular involvement (retinitis

Fever could be the only clinical manifestation

Candida- Nosocomial Bloodstream Infections

(Candida is the fourth in causing nosocomial bloodstream infections (BSI

			% BSI				% Crude Mortality	
Rank	Pathogen	BSI per 10,000 admissions	Total (n=20,978)	ICU (n=10,515)	Non-ICU (n=10,515)	Total	ICU	Non-ICU
1.	CoNS	15.8	31.3	35.9	26.6	20.7	25.7	13.8
2.	*S aureus*	10.3	20.2	16.8	23.7	25.4	34.4	18.9
3.	*Enterococcus* spp	4.8	9.4	9.8	9.0	33.9	43.0	24.0
4.	*Candida* spp	4.6	9.0	10.1	7.9	39.2	47.1	29.0
5.	*E coli*	2.8	5.6	3.7	7.6	22.4	33.9	16.9
6.	*Klebsiella* spp	2.4	4.8	4.0	5.5	27.6	37.4	20.3
7.	*P aeruginosa*	2.1	4.3	4.7	3.8	38.7	47.9	27.6
8.	*Enterobacter* spp	1.9	3.9	4.7	3.1	26.7	32.5	18.0
9.	*Serratia* spp	0.9	1.7	2.1	1.3	27.4	33.9	17.1
10.	*A baumannii*	0.6	1.3	1.6	0.9	34.0	43.4	16.3

Wisplinghoff H, et al. *Clin Infect Dis.*. 2004;39:309-317

Candidiasis - diagnosis

:Laboratory Diagnosis

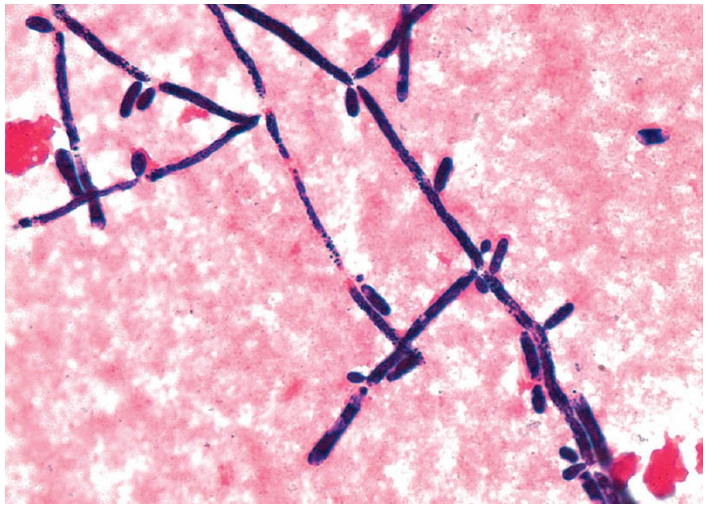
.Specimen depend on site of infection

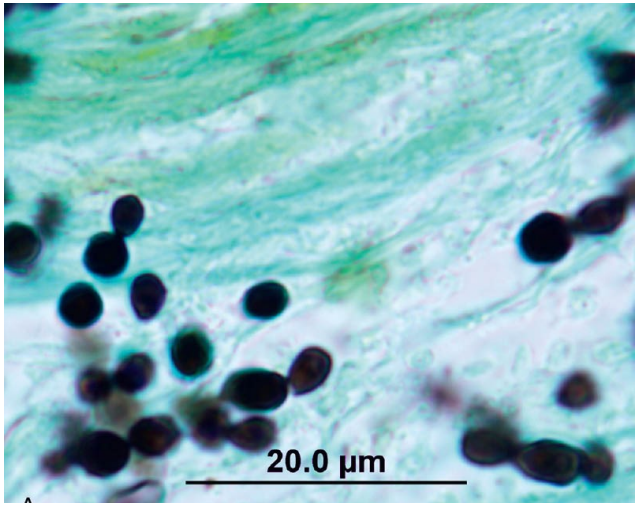
Swabs, Urine, Blood, Respiratory specimens, CSF,
Blood for serology

: **Direct microscopy**

.Gram stain, KOH, Giemsa, GMS, or PAS stained smears

Budding yeast cells and pseudohyphae will be seen in stained smear or .KOH



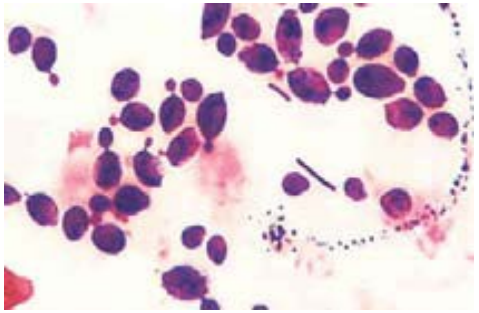


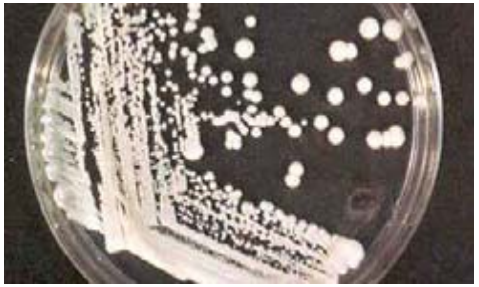
Candidiasis - diagnosis

:Culture

on SDA & Blood agar at 37^{o} ,C

.creamy moist colonies in 24 - 48 hours





(Blood culture (What do you Know

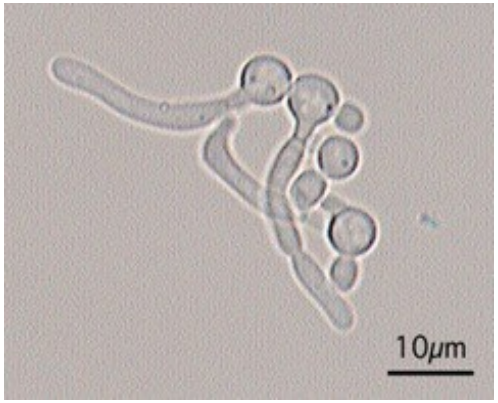
Candidiasis - diagnosis

Because *C. albicans* is the most common species to cause infection

We use do the follwoing tests to identify *C. albicans*

Germ tube test .1

Formation of germ tube when cultured in serum at 37 C



Germ tube test

Chlamydospore production in corn meal Agar .2 ((CMA

Resistance to 500 .3µ(g/ml Cycloheximide (will grow on Mycobiotic Medium

,If these 3 are positive ⇒ yeast is *C.albicans*

,If negative, then it could be any other yeast

.Use Carbohydrate assimilations and fermentation commercial kits available for this like: API 20C, API 32C

(Culture on Chromogenic Media (CHROMagar™ Candida


Chlamydospores of *C. albicans* in CMA

Candidiasis - diagnosis

:Serology

Patient serum

Test for Antigen , e.g. Mannan antigen using ELISA

Test for Antibodies

PCR

Management of systemic fungal infections

!Begin antifungal therapy - <u>EARLY</u>

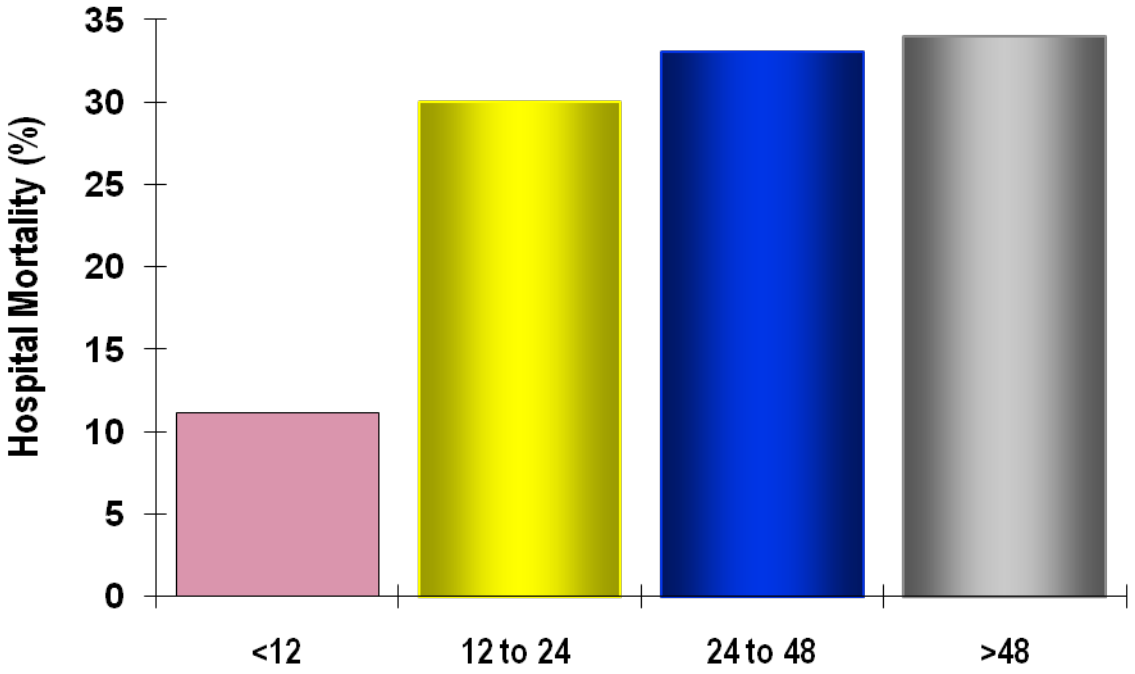
:Also

Control the underlying disease

Remove/decrease immunosuppression

Restore Immune Function

DELAYING ANTIFUNGAL THERAPY WILL INCREASE MORTALITY RATE



Morrell M, et al. *Antimicrob Agents Chemother* 2005;49:3640-5

Treatment of Candidiasis

,Oropharyngeal: Topical Nystatin suspension

.Clotrimazole troches ,Miconazole, Fluconazole suspension

Vaginitis: Topical; Miconazole, Clotrimazole, Nystatin

:Systemic treatment of Candidiasis

Fluconazole
Voriconazole
Caspofungin
Amphotericin

Candidemia:

Treat for 14 days after last positive culture and resolution of signs and symptoms

Remove all intravascular catheters, if possible

In Vitro Susceptibility of *Candida* spp.

Antifungal susceptibility testing in not done routinely in the .microbiology lab

:Points to consider

C. glabrata can be less susceptible or resistant to fluconazole

C. krusei is resistant to fluconazole

Pulmonary Cryptococcosis

Causative agent

Cryptococcus neoformans

C. gattii

A typical yeast with a thick capsule

Source of infection

Pigeon or birds droppings & contaminated soil

Pathogenesis

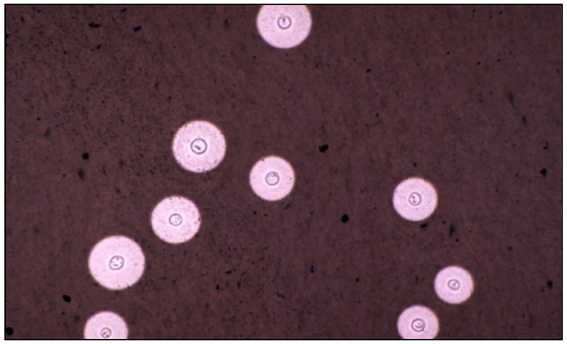
Human infection by inhalation

infections could be asymptomatic

May develop pneumonia, disseminate to CNS causing (meningitis (immunological status of the host

Cryptococcosis

Lab Diagnosis
India Ink preparation .1
Yeast cell with a thick capsule



Culture on SDA .2
Identify using API 20C , Urease +ve
Phenol oxidase +ve

: Serology .3
Capsular Antigen by latex agglutination
excellent sensitivity

Cryptococcosis

Treatment

Systemic fungal agents

- Amphotericin B
- Combination of Amphotericin B & flucytosine

(Pneumocystosis (PCP

Opportunistic fungal pneumonia

.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

It has been proven to be a fungus

Does not grow in laboratory media e.g. SDA

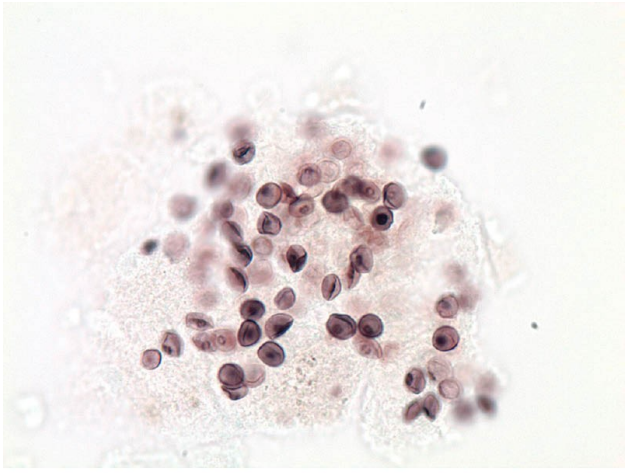
Naturally found in rodents (rats), other animals (goats, horses),
.Humans contract it during childhood

Pneumocystosis

:Laboratory Diagnosis

Patient specimen: Bronchoscopic specimens (B.A.L.), Sputum, Lung .biopsy tissue

Histologic sections or smears stained by.(Silver stain (GMS better sensitivity)) Immunuofluorescence



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

Treatment: Trimethoprim – sulfamethoxazole

Thank you