Lecture 7: lect. Dr. Ahmed Yaseen Abed

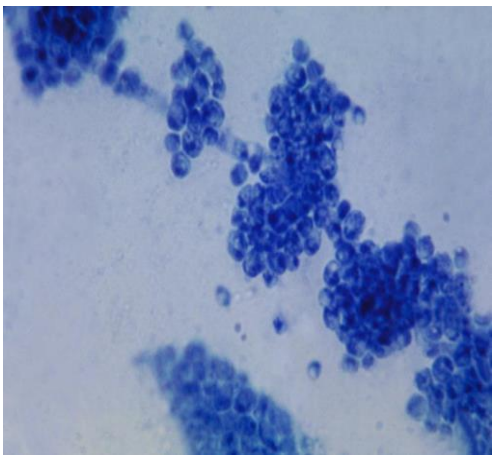
Infection caused by yeasts (Candidiasis and Cryptococcosis).

Candidiasis:- is a fungal infection caused by yeasts that belong to the genus Candida.

Species:-

There are over 20 species of Candida yeasts that can cause infection in humans, the mostcommon of which is ***Candida albicans.*** Candida yeasts normally live on the skin and mucous membranes without causing infection; however, overgrowth of these organisms can cause symptoms to develop. Symptoms of candidiasis vary depending on the area of the body that is infected.

There is an increasing incidence of infections caused by ***C. glabrata*** and ***C. rugosa***, which could be because they are frequently less susceptible to the currently used **azole** antifungals. Other medically important Candida species include ***C. parapsilosis***, ***C. tropicalis***, and ***C. dubliniensis.***



Candida species : general feature:

- Normal flora
- Yeast like fungi
- Reproduction by budding
- Culture morphology : white to opaque on SDA
- Only candida albican has germ tube feature

Type candidiasis:

1- Oropharyngeal / Esophageal Candidiasis ("Thrush"):-

Candidiasis that develops in the mouth or throat is called "thrush" or oropharyngeal candidiasis. The most common **symptom** of oral thrush is **white patches or plaques on the**

tongue and other oral mucous membranes. This infection is uncommon among healthy adults.

Risk of oral Candidiasis:-

Candida infections of the mouth and throat are uncommon among adults who are otherwise healthy. Oral thrush occurs most frequently among babies less than one month old, the elderly, and groups of people with weakened immune systems. Other factors associated with oral and esophageal candidiasis include:

- HIV/AIDS
- Cancer treatments
- Organ transplantation
- Diabetes
- Corticosteroid use
- Dentures
- Broad-spectrum antibiotic use

Lab. Diagnosis of Oral Candidiasis:-

By taking a scraping of the affected areas to examine under a microscope. A culture may also be performed; however, because Candida organisms are normal inhabitants of the human mouth, a positive culture by itself does not make the

diagnosis.

2- Genital / vulvovaginal candidiasis (VVC):-

Genital / vulvovaginal candidiasis (VVC) is also sometimes called a "yeast infection," and it occurs when there is overgrowth of the normal yeast in the vagina. Candida is always present in and on the body in small amounts. However, when an imbalance occurs, such as when the normal acidity of the vagina changes or when hormonal balance changes, Candida can multiply. When that happens, symptoms of candidiasis may appear.

Symptoms of Genital / Vulvovaginal Candidiasis:-

Women with VVC usually experience genital itching, burning, and sometimes a "cottage cheese-like" vaginal discharge. Men with genital candidiasis may experience an itchy rash on the penis.

Risk of Genital / Vulvovaginal Candidiasis:-

Nearly 75% of all adult women have had at least one "yeast infection" in their lifetime. On rare occasions, men can also get genital candidiasis. VVC occurs more frequently and more severely in people with weakened immune systems. Other conditions that may put a woman at risk for genital candidiasis include:

- Pregnancy
- Diabetes
- Long-term use of broad-spectrum antibiotics
- Use of corticosteroid medications

Lab.Diagnosis of Genital / Vulvovaginal Candidiasis:-

Usually the diagnosis is made by taking a sample of the vaginal secretions and looking at the sample under a microscope to see if an abnormal number of Candida organisms are present. A fungal culture may not always be useful because Candida species are normal inhabitants of the body.

3- Invasive Candidiasis:-

Invasive candidiasis is a fungal infection that can occur when Candida yeasts enter the bloodstream. Candidemia (a bloodstream infection with Candida), is extremely rare in people without risk factors.

Symptoms of Invasive Candidiasis:-

The symptoms of invasive candidiasis are not specific. Fever and chills that do not improve after antibiotic therapy are the most common symptoms. If the infection spreads to other organs or parts of the body such as kidneys, liver, bones, muscles, joints, spleen, or eyes, additional symptoms may develop, which vary depending on the site of infection. If the infection does not respond to treatment, the patient's organs may stop working.

Risk of Invasive Candidiasis:-

Candidemia (a bloodstream infection with Candida), is the fourth most common bloodstream infection among hospitalized patients in the United States. People at high risk for developing candidemia include:

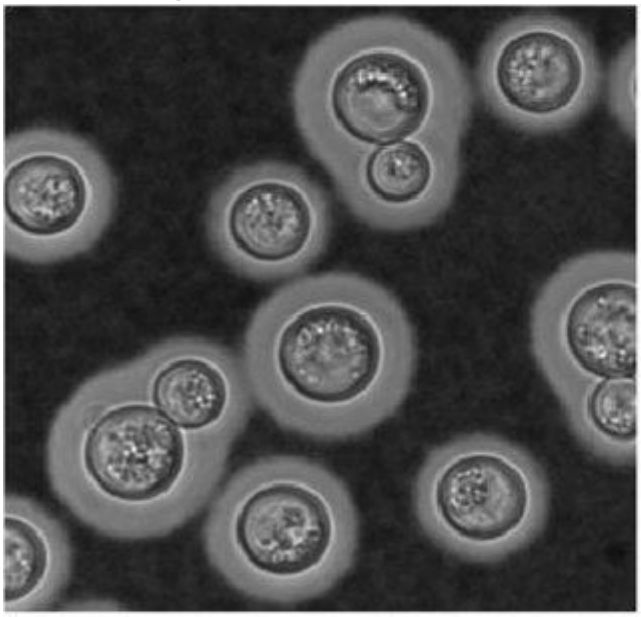
- Intensive care unit (ICU) patients
- Surgical patients
- Patients with a central venous catheter
- People whose immune systems are weakened (such as people with HIV/AIDS)
- Very low-birth-weight infants

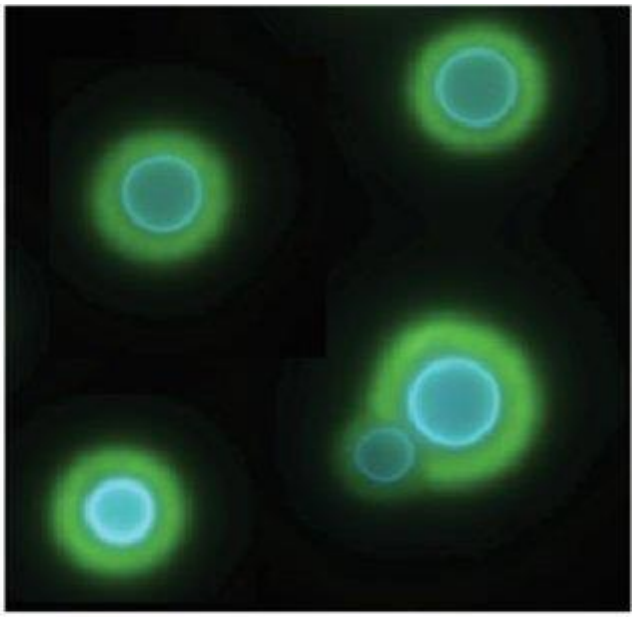
Lab.Diagnosis of Invasive Candidiasis:-

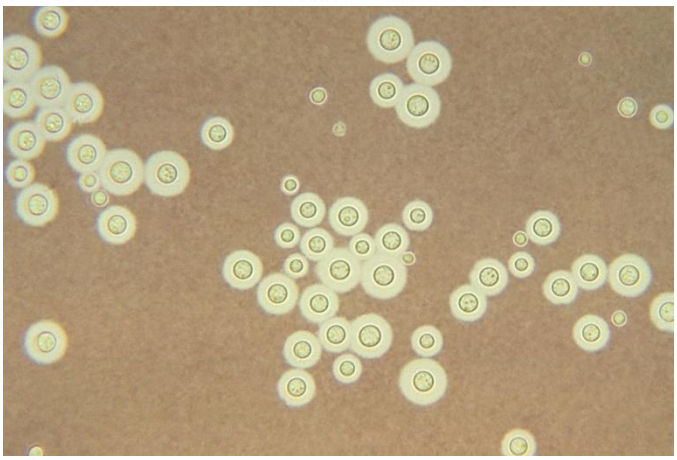
Invasive candidiasis is primarily diagnosed through blood culture.

Cryptococcus:-

Cryptococcus (Greek for "hidden sphere") is a genus of fungus. These fungi grow in culture as yeasts. The sexual forms or teleomorphs of Cryptococcus species are filamentous fungi in the genus Filobasidiella. The name Cryptococcus is used when referring to the yeast states of the fungi.







General characteristics

The cells of these species are covered in a thin layer of glycoprotein capsular material that has a gelatin-like consistency and that, among other functions, serves to help extract nutrients from the soil. However, the C. neoformans capsule is different, in being richer in **glucuronic acid** and **mannose**, having O-acetyl groups, and functioning as the major virulence factor in cryptococcal infection and disease.

Infectious species

There are about 37 recognized species of Cryptococcus, but the taxonomy of the group is currently being re-evaluated with up-to-date methods. The majority of species live in the soil and are not harmful to humans. Very common species include ***Cryptococcus laurentii*** and ***Cryptococcus albidus***. Of all species, ***Cryptococcus neoformans*** is the major human and animal pathogen. However, Cryptococcus laurentii and Cryptococcus albidus have been known to occasionally cause moderate to-severe disease, to be specific meningitis, in human patients with compromised immunity (owing to HIV infection, cancer chemotherapy, metabolic immunosuppression, et cetera).

C. neoformans

Cryptococcus neoformans is the most prominent medically important species. It is best known for causing a severe form of meningitis and meningo-encephalitis in people with HIV/AIDS. It may also infect organ transplant recipients and people receiving certain cancer treatments. ***C. neoformans*** is found in the droppings of wild birds, often pigeons; when dust of the droppings is stirred up it can infect humans or pets that inhale the dust. Infected humans and animals do not transmit their infection to others; they are not infectious. When plated on Niger or birdseed agar, ***C. neoformans*** produces melanin, which causes the colonies to have a brown color, and it is believed that this melanin production may be an important virulence factor.

species in lung tissue

Other species of Cryptococcus which cause moderate infections :-

C. gattii

C. albidus

C. uniguttulatus:

Antigenic Structure:-

The capsular polysaccharides, regardless of serotype, have a similar structure: They are long, unbranched polymers consisting of an -1,3-linked polymannose backbone with -linked monomeric branches of xylose and glucuronic acid. During infection, the capsular polysaccharide is solubilized in spinal fluid, serum, or urine and can be detected by agglutination of latex particles coated with antibody to the polysaccharide. With proper controls, this test is diagnostic of cryptococcosis. Patient antibodies to the capsule can also be measured, but they are not used in diagnosis.

Pathogenesis:-

Infection follows inhalation of the yeast cells, which in nature are dry, minimally encapsulated, and easily aerosolized. The primary pulmonary infection may be asymptomatic or may mimic an influenza-like respiratory infection, often resolving spontaneously. In patients who are compromised, the yeasts may multiply and disseminate to other parts of the body but preferentially to the central nervous system, causing cryptococcal meningoencephalitis. Other common sites of dissemination include the skin, eye, and prostate gland. The inflammatory reaction is usually minimal or granulomatous.

Clinical Findings:-

The major clinical manifestation is chronic meningitis with spontaneous remissions and exacerbations. The meningitis may resemble a brain tumor, brain abscess, degenerative central nervous system disease, or any mycobacterial or fungal meningitis.

occal meningitis may fluctuate over long periods, but all untreated cases are ultimately fatal. About 5–8% of patients with AIDS develop cryptococcal meningitis. The infection is not transCerebrospinal fluid pressure and protein may be increased and the cell

count elevated, whereas the glucose is normal or low. Patients may complain of headache, neck stiffness, and disorientation. In addition, there may be lesions in skin, lungs, or other organs. The course of cryptocmitted from person to person.

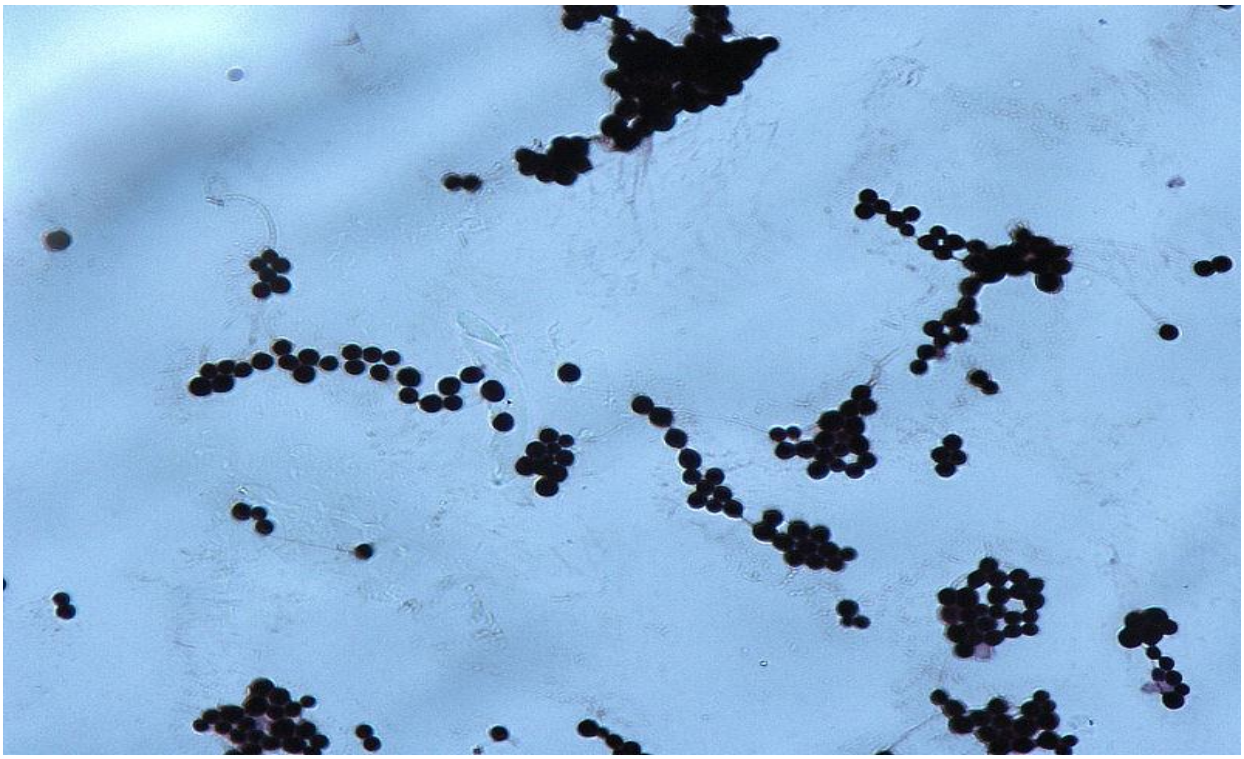
Diagnostic Laboratory Tests

Specimens:-

Specimens include spinal fluid, tissue, exudates, sputum, blood, and urine. Spinal fluid is centrifuged before microscopic examination and culture.

Microscopic Examination:-

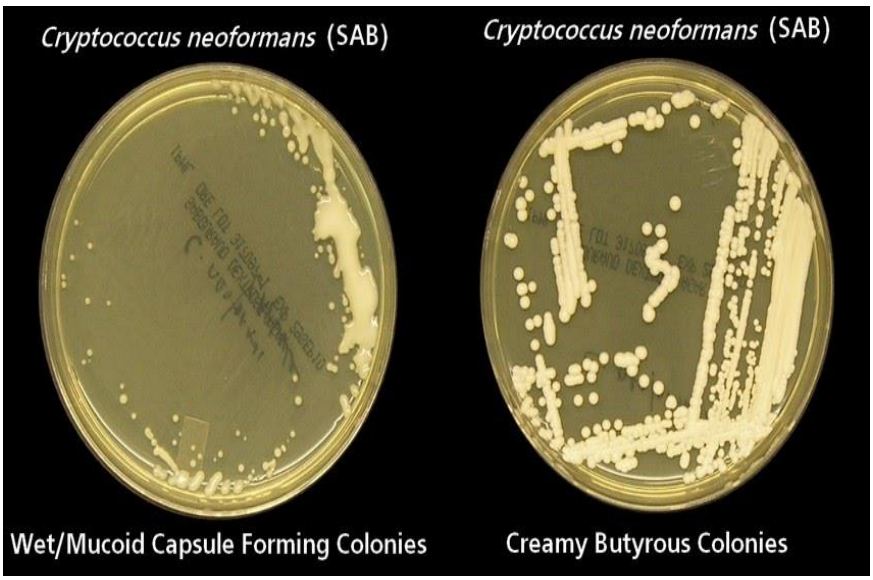
Specimens are examined in wet mounts, both directly and after mixing with India ink, which delineates the capsule. Cryptococcus spp. can be distinguished under Gram staining - the India Ink method is just a confirmatory test.



C. neoformans stained by Gram stain

Culture:-

Colonies develop within a few days on most media at room temperature or 37 °C. Media with cycloheximide inhibit C neoformans and should be avoided. Cultures can be identified by growth at 37 °C and detection of urease . Alternatively, on an appropriate diphenolic substrate, the phenol oxidase (or laccase) of C neoformans produces melanin in the cell walls and colonies develop a brown pigment.



Serology:-

Tests for capsular antigen can be performed on cerebrospinal fluid and serum. The latex slide agglutination test for cryptococcal antigen is positive in 90% of patients with cryptococcal meningitis. With effective treatment, the antigen titer drops—except in AIDS patients, who often maintain high antigen titers for long periods.

Combination therapy of amphotericin B and flucytosine has been considered the standard treatment for cryptococcal meningitis, though the benefit from adding flucytosine remains controversial. Amphotericin B (with or without flucytosine) is curative in most patients. Since AIDS patients with cryptococcosis will almost always relapse when amphotericin B is withdrawn, they require perpetual suppressive therapy with fluconazole. Fluconazole offers excellent penetration of the central nervous system.

Epidemiology & Control:-

Bird droppings (particularly pigeon droppings) enrich for the growth of C neoformans and serve as a reservoir of infection. The organism grows luxuriantly in pigeon excreta, but the birds are not infected. In addition to patients with AIDS or hematologic malignancies, patients being maintained on corticosteroids are highly susceptible to cryptococcosis.