Cryptococcus neoformans

Cryptococcus neoformans is an opportunistic fungal infection that causes cryptococcosis, a severe disease of the CNS. C. neoformans is monomorphic and only exists as yeast with narrow-based buds measuring 5-10 um. It is encapsulated with a polysaccharide capsule that helps evade phagocytosis. In addition, its virulence is increased by the ability to undergo phenotypic switching and change the structure of its capsule. It is commonly found in the soil or in pigeon droppings and can cause disease when inhaled. Healthy individuals can demonstrate a range of symptoms, from asymptomatic to pneumonia or meningoencephalitis. However, immunosuppressed patients, such as HIV/AIDS patients or patients on chronic corticosteroid therapy, are most commonly affected and more likely to have disseminated disease. Dissemination into the CSF can commonly cause meningitis that extends into the perivascular space with lesions that appear similar to soap bubbles. Diagnosis of cryptococcosis can be made in many different ways. A Gram stain of the organism collected from CSF stained with India ink reveals the oval yeast with a halo surrounding it, signifying the capsule. A mucicarmine stain or periodic acid-Schiff stain can also be used, which stains the polysaccharide capsule a bright red. In addition, a latex agglutination test can also be used, which uses antibody-coated latex beads that binds to cryptococcal antigen present in the assay. Treatment includes amphotericin B and flucytosine for meningitis and disseminated disease. Fluconazole can also be used as long-term prophylaxis in immunosuppressed patients.



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Characteristics

Monomorphic
Mono-morphic-man
This fungus is monomorphic, which means that it only exists as one form at all temperatures.

Encapsulated
Capsule
This organism is encapsulated, which allows it to evade phagocytosis.

Polysaccharide Capsule
Polly-sack Capsule
Cryptococcus neoformans contains a polysaccharide capsule that is able to undergo phenotypic switching and change capsule structure to further increase virulence.

Narrow-Based Buds
Narrow Based Bud wheels
This organism has narrow-based buds off of the yeast, in contrast to blastomycosis which has broad-based buds.

Latex Agglutination
Latex-feathers
This disease can be detected using a latex agglutination test, which involves antibody-coated latex beads that will bind to antigen present in the assay.

Pigeons
Pigeons
This disease can be obtained by inhaling soil containing pigeon droppings, which contains the organism. There is no person-to-person transmission.

India Ink
India ink
Diagnosis can be made using an India ink stain of the organism in the CSF, which will appear as oval yeast with a surrounding clear halo.

Mucicarmine stain
Mucous-car
This organism can be stained with a mucicarmine stain, which stains the polysaccharide capsule a bright red.

Signs and Symptoms

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AIDS/Immunocompromised

Band-AIDS

This disease most commonly affects immunocompromised patients, in particular, patients with poor cell-mediated immunity. Patients on chronic corticosteroid therapy or immunosuppressants, such as transplant patients, are more likely to have severe disseminated disease.

Meningitis

Men-in-tights

This disease presents most often as meningitis that can progress to meningoencephalitis, with altered mental status in addition to the meningitis.

Soap Bubble Lesions in Brain

Soap Bubbles

Neuroimaging may reveal a “soap bubble” appearance of cerebral lesions. These represent gelatinous pseudocysts created by the organism and its extension into the perivascular space.

Pneumonia

Nude-Mona

Cryptococcus neoformans is spread through inhalation and can cause pneumonia in both healthy and immunosuppressed patients.

Treatment

Fluconazole

Flute-a-hole

This disease can be treated prophylactically with long-term administration of fluconazole to immunosuppressed patients or those at high-risk to prevent cryptococcal meningitis.

Flucytosine

Flute-side-toe

Flucytosine is an anti-fungal that inhibits DNA synthesis. Combination of amphotericin B and flucytosine is the recommended treatment for disseminated cryptococcal disease.

Amphotericin

Amphibian-terminator

Disseminated cryptococcal disease is treated with amphotericin B, an anti-fungal that binds ergosterol in the fungal membranes, and has severe systemic side effects like fever, nephrotoxicity, and arrhythmias.

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