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Review on Mucormycosis

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Abstract: *An increasing number of virulent, angioinvasive spores belonging to the order Mucorales are known to infect individuals who are immunocom promised with potentially fatal diseases. The prognosis for this debilitating infection has improved because of advances in pathophysiology understanding, early detection, and the recent development of active, nontoxic medications. However, due in part to the limited yield and complexity of culture-based and molecular diagnostic approaches, rates of delayed diagnosis and mortality remain high. Novel diagnostic techniques and efficient treatment modalities are thus desperately needed.*

Keywords: Amphotericin, Isavuconazole, Ketoacidosis, Diabetes, Hematopoietic stem cell transplantation, Immuno compromised

I. INTRODUCTION

Eukaryotic microorganisms are fungi. Fungi can take the shape of molds, yeasts, or an amalgamation of the two. Certain fungi can induce allergic, systemic, superficial, cutaneous, or subcutaneous sicknesses. Yeasts are microscopic fungi made up of single cells that proliferate by budding. In contrast, hyphae, or lengthy filaments, are found in molds and grow through apical extension. Hyphae have varying numbers of nuclei and can be either regularly or sparsely septate. All fungi are heterotrophic, meaning that they release hydrolytic enzymes into their immediate environment to digest food externally, regardless of their size or form (absorptive nutrition). Fungi also have a chitinous cell wall, plasma membranes containing the amino acid lysine synthesized by the L-α-adipic acid biosynthesis pathway, and the ability to synthesize lysine.

Characteristics of fungi

- Eukaryotic
- Nonphotosynthesis (Heterotropic)
- Most are multicellular
- Most are microscopic molds or yeasts
- The Cell walls of fungi are made of chitin (polysaccharides)
- Some are edible
- The Study of fungi is known as MYCOLOGY

Types of Fungi

There are Five Types Of Fungi
Chytridiomycota, Zygomycota, Glomeromycota, Ascomycota, and Basidiomycota.

1. Chytridiomycota

Chytrids, the organisms found in Chytridiomycota, are usually aquatic and microscopic. They are usually asexual and produce spores that move around using flagella, small tail-like appendages.

2. Zygomycot

Zygomycetes are mainly terrestrial and feed off of plant detritus or decaying animal material. They also cause problems by growing on human food sources. One example of a zygomycete is Rhizopus stolonifer, a bread mold. The hyphae of

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zygomycetes are not separated by septa, making their mycelia essentially one large cell with many nuclei. They usually reproduce asexually, through spores.

3. Glomeromycota

Glomeromycetes make up half of all fungi found in soil, and they often form mycorrhizae with plants; in fact, 80-90 percent of all land plants develop mycorrhizae with glomeromycetes. The fungi obtain sugars from the plant, and in return, dissolve minerals in the soil to provide the plant with nutrients. These fungi also reproduce asexually.

4. Ascomycota

Ascomycetes are often pathogens of plants and animals, including humans, in which they are responsible for infections like athlete's foot, ringworm, and ergotism, which causes vomiting, convulsions, hallucinations, and sometimes even death. However, some ascomycetes normally are found inside humans, such as Candida albicans, a yeast that lives in the respiratory, gastrointestinal, and female reproductive tracts.

5. Basidiomycota

Like ascomycetes, basidiomycetes also produce sexual spores called basidiospores in cells called basidia. Basidia are usually club-shaped, and basidiomycetes are also known as club fungi. Most basidiocytes reproduce sexually. Mushrooms are a common example of basidiomycetes.

II. EPIDEMIOLOGY

Over the previous 20 years, the epidemiology of mucormycosis has been complicated and even contentious. Because mucormycosis is not a reportable condition, the precise prevalence and incidence of this infection are unknown. Assessing the full burden of this infection is also difficult due to challenges in diagnosing mucormycosis in the current era of very low autopsy ratesand rather inaccurate hospital discharge codes.

The findings of multiple recent US reports were consistent with the findings of a recent population-based study of mucormycosis in France that mostly relied on hospital discharge codes. According to this research, the prevalence of mucormycosis is rising, particularly in hematopoietic stem cell transplant (HSCT) and hematology units.

Mechanism of Action:

Most fungi's cell membranes contain ergosterol, which amphotericin B binds to cause action. Following its attachment to ergosterol, it generates ion channels that cause protons and monovalent cations to be lost. This induces depolarization and concentration-dependent cell death.

Additionally, amphotericin B promotes oxidative damage to the cells by generating free radicals, which in turn raises the permeability of the membrane. Amphotericin B additionally stimulates phagocytic cells, aiding in the removal of fungal infections.

Amphotericin B has a half-life ranging from 24 hours to 15 days.

Administration:

Amphotericin B is amphoteric (can act as both an acid and a base) and virtually water-insoluble. It is not absorbable via oral or intramuscular administration.

Objectives amphotericin B.:

- Identify the approved indications of amphotericin B.
- Review the mechanism of action of amphotericin B.
- Describe the adverse of amphotericin B.
- Summarize interprofessional team strategies for improving care coordination andcommunication to advance appropriate clinical outcomes with amphotericin B therapy totreat mycotic infections to optimal patient outcomes and mitigate toxicity and adverseevents.

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Mechanism of toxicity:

Mammalian and fungal membranes both contain sterols, a primary membrane target foramphotericin B. Because mammalian and fungal membranes are similar in structure andcomposition, this is one mechanism by which amphotericin B causes cellular toxicity.

Amphotericin B molecules can form pores in the host membrane as well as the fungalmembrane. This impairment in membrane barrier function can have lethal effects.

Therapy for Mucormycosis

1) Early diagnosis and four steps are essential for the successful treatment of mucormycosis.
2) if possible. the reversal of underlying predisposing risk factors
3) Debridement surgically when appropriate
4) prompt administration of antifungal medication

Early Diagnosis

A recent study by Chamilos measured the advantages of starting polyene antifungal medication early. They found that starting treatment for mucormycosis within 5 days of diagnosis significantly increased survival compared to starting polyene therapy at least 6 days later (83% vs 49% survival).

Therefore, it is essential to diagnose mucormycosis as soon as possible to start vigorous antifungal medication as soon as possible.

Drugs Used for the Treatment of Mucormycosis:-

The 2 main classes of antifungal medications used to treat mucormycosis are polyenes (amphotericin formulations) and triazoles (isavuconazole and posaconazole).

Amphotericin B and isavuconazole are the 2 agents currently FDA-approved for theprimary therapy of mucormycosis.

III. CONCLUSION

Mucormycosis is a potentially deadly kind of fungal infection that is extremely invasive and advances quickly. There have been reports of this infection's indolent clinical course, despite its rarity.

Immunocompromised patients are increasingly becoming infected with mucormycosis, and the death rate from traditional treatment is still too high. Even though research on the pathophysiology of mucormycosis is still in its early stages, significant progress has lately been made in understanding how Mucorales both cause disease and persist in its host.

The triple threat of diabetes (high hereditary prevalence), excessive corticosteroid use (which raises blood sugar and increases the risk of opportunistic fungal infection), and COVID-19 (which causes cytokine storm, lymphopenia, and endothelial damage) appears to be the cause of the rise in mucormycosis in the Indian context. The goal should be to maintain ideal hyperglycemia and only use corticosteroids sparingly and on the available data.

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