Mycology-intro

1. Characteristics of Fungi: Fungi are eukaryotic organisms belonging to the Kingdom Fungi. They are heterotrophic, lack chlorophyll, and exist as yeasts or filamentous molds (hyphae). Their cell wall is composed of chitin and β-glucan, while their membrane contains ergosterol, both of which are targets for antifungal drugs. Fungi reproduce via spores (sexual (telomorphs)or asexual(anamorphs) (conidia)) and can be saprophytic (feeding on dead tissue) or parasitic (feeding on living organisms).mostly obligate aerobic and no oblgate anearobes
2. Importance of Fungi: They damage crops and the food chain, produce antibiotics like penicillin, and cause human diseases, particularly in immunosuppressed individuals.
3. Types of Fungi:
- Yeasts: Single-celled organisms reproducing by budding may make pseudhyphae, e.g., Candida albicans (endogenous inf.) and Cryptococcus neoformans(exogenous lung inf.)(opurtutinsic)
- Molds: Filamentous fungi with branching hyphae (mycelium) and asexual spores in sporangiospores , e.g., Aspergillus , Zygomycetes (oppurtutinsic inf.) and Dermatophytes.
- Dimorphic Fungi: Grow as yeasts in tissues at 37°C and as molds in the environment at 22°C, e.g., Coccoides,Histoplasma,Blastoma.

4. Fungal Diseases:
- Allergies: Caused by airborne fungal spores, such as those from Aspergillus fumigatus.
- Toxins (Mycotoxicosis): E.g., aflatoxins from Aspergillus flavus,A.parasitcus contaminate food and cause liver cancer.(by aflatoxin epoxidation convert to B1 aflatoxin which inh.p53)
- Infections (Mycoses):increase in immunosupressed Range from 1.superficial (no invade) like petryarsis versocolor ,tenea and cutaneous (invasion and imm.resp.) (including hair and nails) like dermatophytes to 2.subcutaneous like chromoblastomycosis, sporotrichosis (rose gardner des.)3.systemic (by dimorphic fungi which is stong pathogen regardless immune)(from lungs and organs), including 4.opportunistic infections in immunocompromised patients(Candida,Cryptococcus,Asperigillus and Zygomycetes,pneumocytis).

5. Diagnosis: Clinical observation is complemented by laboratory investigations such as microscopy (speicman+KOH (to clear from other microorg. and fungi resist by chitin)+ Calcofluor white stains or other special stains (mythel blue,lamaphenol blue,ink,PAS), culture on Sabouraud dextrose agar, serology, and PCR.
6. Antifungal Therapy: Includes polyenes(fungocidal) (Amphotericin B,Nystatin), azoles (fungostatin), echinocandins (caspofungin), griseofulvin ,5FC and Allylaminase(terpinafine).
7. Spore Types: Include conidia, blastoconidia (budding spores in yeasts), arthroconidia (fragmented hyphae), and spherules with endospores in tissues.

Mycoses

1. Skin and Subcutaneous Mycoses: These are categorized into three types: superficial, cutaneous, and subcutaneous infections.

• Superficial Mycoses: Caused primarily by Malassezia species, such as M. furfur and M. globosa, which are round lipophilic yeasts and normal skin commensals.

→ Pityriasis versicolor : This affects the stratum corneum of the trunk and proximal limbs, common in tropical regions and triggered by excisive sun exposure. Clinical features include non-itchy hypo- or hyperpigmented macules (by carboxilic acid that release and cause depigmentation) that may coalesce into scaly plaques. Diagnosis involves Wood's light examination (pale green fluorescence) and KOH staining, revealing "spaghetti and meatballs" morphology. Treatment includes topical azoles or oral azoles for sever cases, though recurrence is common.

→ Seborrheic Dermatitis: (multicausal and assosiate with M.furfur)This involves skin hyperproliferation with dandruff, presenting as red lesions with greasy scales, often affecting the scalp.

• Cutaneous Mycoses: These are caused by dermatophytes, including generas:Trichophyton(pencil shape), Microsporum(spindle shape), and Epidermophyton(byfurcated hyphae with club shape), which infect keratinized tissues (skin, hair, nails) without spreading to deeper tissues.

• Tinea Infections (ring worm like): These include Tinea pedis (Athlet's foot), Tinea corporis(in hairless body regions)/cruris (in perineal), Tinea capitis (scalp scaling and hair loss), and Tinea unguium (painless broken discolored nails). Risk factors include direct contact (anthropophilic, zoophilic, geophilic sources) and environmental factors like heat and humidity. Diagnosis involves microscopic examination with KOH (detecting branching hyphae and arthrospores which can be in hair ectothrix or endothrix) and culture on Sabouraud's dextrose agar folowed by lactophenol blue staining. Treatment includes topical antifungals (e.g., miconazole) or systemic (e.g., terbinafine).

• Subcutaneous Mycoses:

• Mycetoma (Madura Foot): Caused by Madurella mycetomatis (fungal eumycetoma) or actinomycetes (bacterial actinomycetoma), this is a chronic granulomatous infection affecting the limbs, often in farmers after trauma. Symptoms include swelling, purplish discoloration, and discharged granules (yellow, black, red). Diagnosis includes black granule and intercalary chlamedospores examination and culture on Sabouraud's agar. Treatment involves systemic antifungals (like amphorecine B) whith surgerical depridment.

2. Opportunistic Mycoses: These occur in immunocompromised individuals, including patients with hematologic disorders, HIV/AIDS, or those receiving immunosuppressive therapies.

→ Candidiasis: Caused by Candida albicans, an oval gram-positive yeast producing pseudohyphae, colonizing mucous membranes.(cause endogenous infection)

• Clinical forms include: skin invasion (in moist worm skin like sub gluteal pseudyperrash, fingerweb lesion) oral thrush (white patches in the mouth) and other GI inf. , vulvovaginitis (itching with thick white discharge), nail infection (chronic , painfull and cause paronychiac) and systemic candidiasis. Risk factors include diabetes, AIDS, prolonged antibiotic use, and catheterization. Diagnosis involves microscopy (KOH prep, germ tube formation test), culture (cornmeal ager then terminal chalmydospores formation), and biochemical tests. Treatment includes topical (nystatin) or systemic antifungals (amphotericin B, ketocanozole).

→ Cryptococcosis: Caused by Cryptococcus neoformans (exogenous), an encapsulated yeast associated with pigeon droppings. It manifests as pulmonary infections or CNS involvement (meningitis). Diagnosis includes India ink staining for capsul and culture on bird seed agar or PCR (favorable). Treatment involves amphotericin B and flucytosine.

→ Aspergillosis: Caused by Aspergillus fumigatus, airborn transmit and cause: bronchopulmonary allergy,in the lungs form fungal balls (asperigilloma) then invasive asperigillosis (necrotic pneumonia,heart inf.,brain inf.)in immunocompromised patients. Diagnosis involves microscopy (non septated dichotomous hyphae with acute angle) . Treatment includes surgery and antifungals (amphotericin B,nystatin).

→ Zygomycosis(rhinocerebral mucormycosis): (ubiquitous saprophytic fungi)Caused by 3 genera :Rhizopus,Absidia, Mucor .this infection affects diabetic or malnourished individuals, leading to rhinocerebral mucormycosis (in nose,aye,heart,brain). Diagnosis involves smear and culture of respiratory secretions and microsopic shape (non septated dichotomous hyphae with wide angle). Treatment includes controlling diabetes, surgery, and amphotericin B.

→ Pneumocystis: caused by pneumocytis jirovecii which cause lethal pneumonia. diagnose :speicemen and silver stain , can't growth in agar (obligate extracellular).treatment:TMP-SMX

3. Endemic Mycoses: These are caused by thermally dimorphic fungi geographically restricted to specific areas, initiating infection through inhalation of conidia lead to pulmonary inf. and systemic inf.

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