Diversity of fungi & fungal

-Important -Extra -Notes

-In boy's slides -In girl's slides

In this link, you will find any correction or notes unmentioned in the team's work. Please check the link below Frequently.
https://docs.google.com/document/d/1WvdeC1atp7J-ZKWOUSukSLsEcosjZ0AqV4z2VcH2TA0/edit?usp=sharing

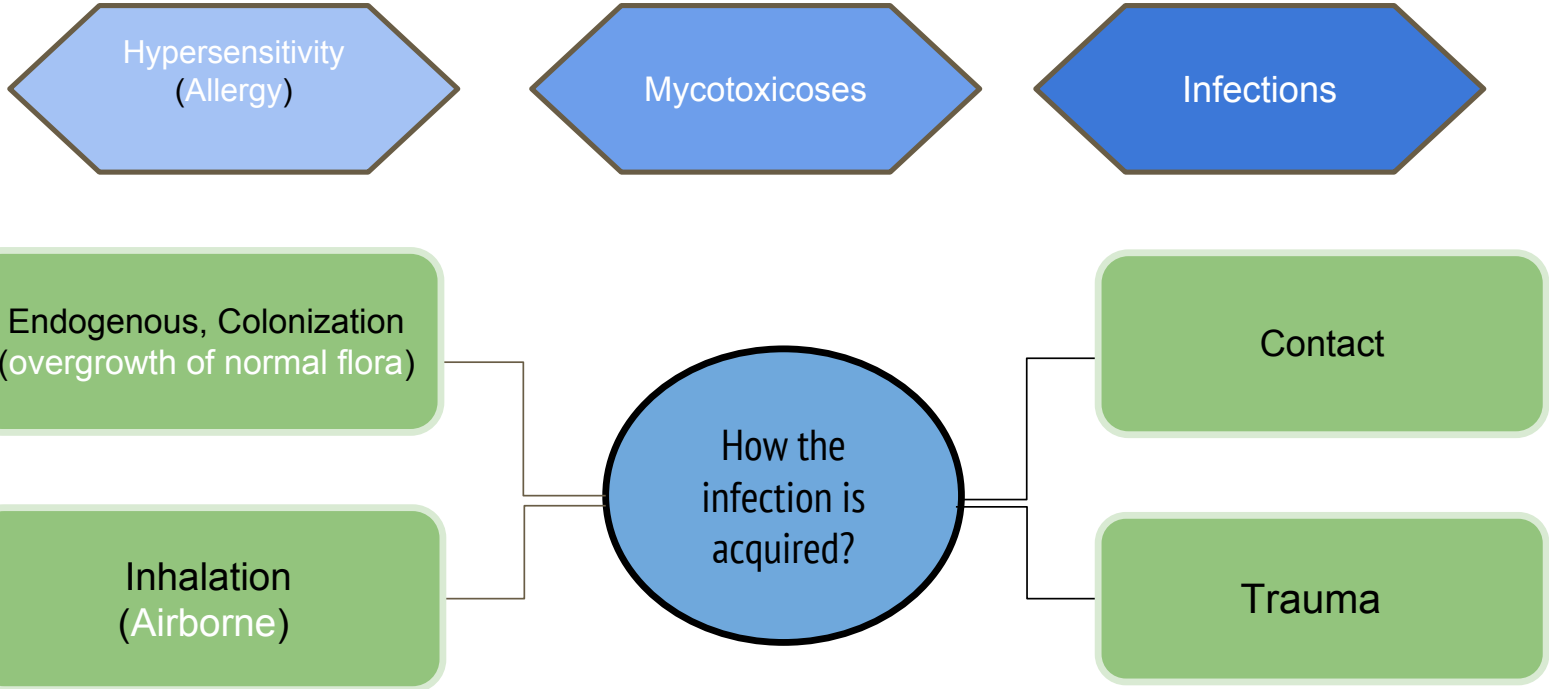
Reviewed by Razan AlRabah & Khalid Alkhani

MICROBIOLOGY TEAM 438

Objectives:

- ★ To provide students with an overview of the common medically important yeasts and mold fungi.
- ★ To provide students with an overview of the major fungal diseases that threatens human health.
- ★ To give a fundamental knowledge about the antifungal agents, their mechanisms of action, and spectrum.

Mycotic Diseases:



Types of Fungal infections (Mycoses)

Superficial Mycoses

- Affect the outer layer of the skin or hair shaft.
- No immune response.

Cutaneous Mycoses

Also called Dermatophytosis.

Infection of the skin, hair or nails caused by a group of keratinophilic fungi, called dermatophytes.




Subcutaneous Mycoses

- Fungal infections involving the dermis, subcutaneous tissues, muscle and may extend to bone.
- Usually they are initiated by trauma.

Primary Systemic Mycoses

- Caused by primary pathogens.
- Contracted by inhalation, Start as respiratory disease.
- Geographically restricted (endemic), north and south America.

Opportunistic Mycoses

- Diseases in immunocompromised host.
- Risk factors.

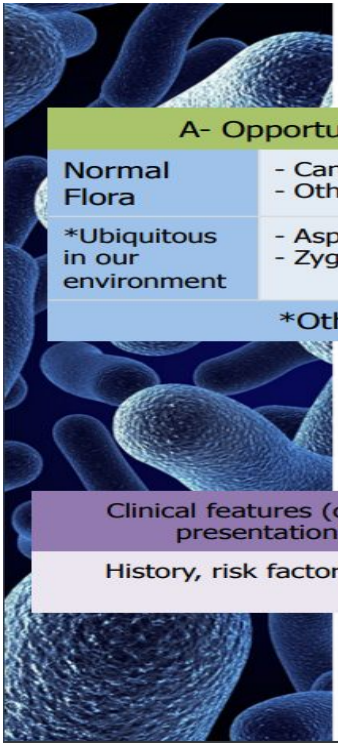
-Examples: HIV/AIDS Hematopoietic stem cell transplant (HSCT) Solid organs transplantation

Malignancies ,Neutropenia Diabetes and Many others.

Cont.

Subcutaneous Mycoses

From MicroTeam 435



The Fungi

A- Opportunistic Fungi	
Normal Flora	- Candida spp. - Other yeast
*Ubiquitous in our environment	- Aspergillus spp. - Zygomycetes spp.
*Other Fungi	

B- Primary Pathogens	
Dermatophytes	Endemic geographically restricted
	- Histoplasma spp. - Blastomyces spp. - Coccidioides spp. - Paracoccidioides spp.

Diagnosis of Fungal Infection

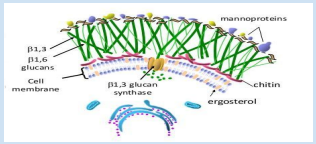
Clinical features (clinical presentation)	Imaging	Lab Investigations
History, risk factors, etc.	Good value in diagnosis and therapy monitoring	-Histopathology -Microbiology

Antifungal agents:

Antifungal agents for Fungi.
Antibiotics for Bacteria.

Target:	Cell membrane	
Group:	★ **Polyenes:**	★ **Azoles:**
Antifungal agents:	• Amphotericin B, lipid formulations. • Nystatin.	• Fluconazole • Ketoconazole • Itraconazole • Voriconazole • Posaconazole • Miconazole, clotrimazole.
Mechanism of action:	**Amphotericin B (MOA):** - Binds to ergosterol within the fungal cell membrane resulting in formation of pores which permit leakage of intracellular contents, and lead to death.	- Inhibits synthesis of ergosterol, the major sterol of fungal cell membrane.
Spectrum of Activity:	-Amphotericin B has an broad antifungal spectrum which includes most fungi that cause human disease.	• Fluconazole: Kills only yeast. • Itraconazole: Kill some of mold like Aspergillus, and can kills yeast but it's weak. • Voriconazole: Can kill both of yeast and mold (Aspergillus). • Posaconazole: Kill both of mold (aspergillus) and yeast, and some of Zygomycetes.

Antifungal agents cont.

Target:	Cell wall	DNA/RNA Synthesis
Group:	★ **Echinocandins:** Very toxic because it's target the glucans.	★ **Pyrimidine analogues:**
Antifungal agents:	• Caspofungin • Micafungin • Anidulafungin - 	• **Flucytosine** Flucytosine is used with **yeast** only (candida species and Cryptococcus neoformans)
Mechanism of action:	• Inhibits B-1,3-D glucan synthase , the enzyme complex that forms glucan polymers in the fungal cell wall. • Glucan polymers are responsible for providing rigidity to the cell wall. • Without glucan the cells cannot grow and survive. -	• Fungal RNA miscoding. • Interfering with DNA synthes.
Spectrum of Activity:	Good Activity Against: • Candida spp • Aspergillus spp Not effective against other types of fungi less toxicity & side effects than azoles & amphotericin B.	• (Restricted spectrum of activity), • Active against: Candida species, and Cryptococcus neoformans. • But now limited (Resistance): Monotherapy.

Summary:

Target	Group	Mechanism of action	Antifungal Agents	Spectrum of activity	Comments
Cell membrane	**Polyenes**	Binds to ergosterol within cell membrane, formation of pores which lead to cell death	Amphotericin B, Nystatin	Broad antifungal spectrum which includes most fungi	Serious toxic side effects (nephrotoxicity)
	Azoles	Inhibit the synthesis of ergosterol	Ketoconazole Itraconazole Fluconazole Voriconazole Posaconazole Miconazole clotrimazole	Fluconazole has a limited or no activity against mould fungi Voriconazol is the drug of choice for Aspergillosis Posaconazole has broader spectrum of activity than other azoles	Not effective against Zygomycosis (except posaconazole) Adverse Effects Drug Interactions
Cell wall	**Echinocandins**	Inhibits glucan synthesis, (glucan polymers in the fungal cell wall)	Caspofungin Micafungin Anidulafungin	Good activity against *Candida spp* ,*Aspergillus spp* Limited or no activity against other fungi	Less toxicity and side effects compared to amphotericin B and azoles
DNA/RNA synthesis	**Pyrimidine analogues**	Fungal RNA miscoding Interfering with DNA synthesis	Flucytosine	Restricted spectrum of activity *Candida* species *Cryptococcus neoformans*	Monotherapy now limited (Resistance)

MCQs :

Answers:1-d 2-d 3-b 4-b 5-a

Q1-which types of fungus found in the cutaneous mycoses?
A-Aspergillus spp
B-candida spp
C-zygomycete
D-dermatophytes

Q2-which type of anti fungal attack cell wall ?
a-Azole
b-Flucytosine
c-polyne
D-micafungin

Q3-which type of Azoles have broad spectrum?
a-fluconazol
b-posaconazole
c-amphotericin B
4-voriconazole

Q4-which of the following have good activity against cryptococcus?
a-Aozles
b-flucytosine
c-metconazole
d-none of them

Q5-what is the function of polyene?
a- bind to ergosterol and formation of pores
b- inhibit synthesis of glucan
c-inhibit synthesis of ergosterol
d-interfering of DNA

SAQ:

1- which type of mycoses may extend to bone?
2-in what labs are fungal diseases diagnosed?
3-How are mycotic diseases acquired?

SAQ:1-Subcutaneous 2- microbiology and histopathology
3- colonization , contact , trauma , inhalation

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