

Medfools Fungus Chart for the USMLE I

Fungus Notes for USMLE I with the usual cheesy mnemonics.

SUPERFICIAL MYCOSES		<i>Spherical yeasts, branched Hyphae</i>	
<i>Malassezia furfur</i>			
Diseases	Diagnosis	Treatment	
Tinea versicolor - chronic superficial skin infection w/ hypo or hyperpigmented areas. Asymptomatic lesions identified by pigment changes/failure to tan . More frequent in hot/humid weather	Branched hyphae, spherical yeasts in KOH treated skin scrapings	Selenium sulfide shampoo, imidazoles	
<i>Exophiala werneckii</i>			
Tinea nigra - chronic superficial infection, black lesions on palms and soles	Branched hyphae, spherical yeasts in KOH treated skin scrapings	Selenium sulfide shampoo, imidazoles	

CUTANEOUS MYCOSES		<i>No Yeast / Branched Hyphae, micro/macroconidia</i>		
Dermatophytoses: <i>Microsporum spp., Trichophyton spp., Epidermophyton floccosum</i>				
Diseases	Habitat/Trans	Pathogenesis	Diagnosis	Treatment
Puritic papules, vesicles, Hypersensitivity to fungal antigens may present as “ dermatophytid ” rxns (NOT an infection! NO hyphae/organisms) Chronic infection esp. w/ heat/humidity . Tinea corporis - ringworm – body Tinea cruris – jock itch- groin Tinea pedis - athlete’s foot- toes Tinea capitis - head Tinea unguium - onychomycosis- nails Tinea barbae - beard	Infect superficial keratinized structures, skin, hair, nails . Spread by direct contact.	Keratinase - results in scaly skin, hair loss, brittle nails	Branched hyphae in KOH treated skin/nail scrapings. Wood’s light for some <i>Microsporum</i>	Topical imidazoles . Tinea capitis, barbae, unguium, w/ oral griseofulvin (hair/nail involvement)

SUBCUTANEOUS MYCOSES		<i>Round/Cigar budding yeast/ Branched hyphae w/ oval conidia at tip of conidiophores</i>		
<i>Sporothrix schenckii</i> (gardener’s disease)				
Diseases	Habitat/Trans	Diagnosis	Treatment	
Causes local pustule/ulcer with nodules along draining lymphatics (think linear distribution)	Soil/vegetation (thorns, splinters) Gardeners at risk . Introduced by trauma	Round or cigar shaped budding yeasts in tissue or 37’ Branching hyphae w/ oval conidia at tip of conidiophores at 25’ . (like a daisy— Think of a Gardener planting daisies smoking a cigar!)	Potassium Iodide Amphotericin B	

SYSTEMIC MYCOSES: general rules

ALL dimorphic, YEASTS in humans (molds in dirt), Human infection by SPORE inhalation, so NO Person-Person transmission (remember yeasts DO NOT make spores), most infections asymptomatic or mild pneumonia. Dissemination results when IMMUNOCOMPROMISED. Grows as MOLD (mycelia w/ spores) at 25°C in Sabouraud's agar and as a YEAST at 37°C in blood agar. Diagnosis by serology or biopsy/culture w/ silver stain. DTH tests useful to RULE OUT diagnoses. Systemic mycoses need the BIG GUNS: amphotericin B or itraconazole

SYSTEMIC MYCOSES				<i>Dimorphic Fungi</i>	
<i>Coccidioides immitis (SW USA, Latin America)</i>					
Diseases	Characteristics	Habitat/Trans	Pathogenesis	Diagnosis	Treatment
Coccidiomycosis - mild lung infection, usually asymptomatic or mild pneumonia. Dissemination leads to bone granulomas or meningitis . 10% develop erythema nodosum (red tender nodules on extensor surfaces, indicated DTH rxn to fungal antigens – NO organisms in lesions) and arthragias - “valley fever”, “desert rheumatism”	In soil, hyphae with alternating arthrospores and empty cells. “Spherules” in tissue	Endemic in arid parts of SW USA, Latin America .	Arthrospores are inhaled. Arthrospores make spherules w/ doubly refractive wall filled with endospores . On rupture, endospores released to form new spherules which spread by direct extension or via blood.	Skin tests w/ coccidioidin or spherulin	Amphotericin B Itraconazole
<i>Histoplasma capsulatum (Ohio and Mississippi river valleys)</i>					
Histoplasmosis - asymptomatic infection or mild pneumonia, disseminated in immunocompromised	NO capsule. Two kinds of asexual spores: tuberculate macroconidia , microconidia	Worldwide, but endemic to Ohio, Mississippi river valleys . (Think OHIstOplama) Bird/bat droppings in soil.	Inhaled microconidia develop into yeasts within macrophages. (<u>H</u> istoplasma <u>H</u> ides in macrophages) Spreads quickly, calcified granulomas.	ID budding yeasts WITHIN macrophages. DTH skin test w/ histoplasmin	Amphotericin B Itraconazole
<i>Blastomyces dermatitidis (East of Mississippi, Central America)</i>					
Blastomycosis - ALMOST ALWAYS SYMPTOMATIC! (IT BLASTS YOU!) - disseminates w/ fever, night sweats, weight loss, skin and lung granulomas	Round yeast w/ doubly refractive wall (like coccidio) , single broad based bud	East of Mississippi, and Central America. Soil, rotten wood.	Inhaled conidia		Amphotericin B Itraconazole
<i>Paracoccidioides brasiliensis (rural Latin America)</i>					
Asymptomatic lung lesions, mild pneumonia	Thick walled yeast, multiple buds	Latin America Soil fungus	Spores inhaled		Amphotericin B Itraconazole

OPPORTUNISTIC MYCOSES

All Monomorphic

Candida albicans (yeast only)

Diseases	Characteristics	Habitat/Trans	Pathogenesis	Diagnosis	Treatment
<p>Vulvovaginitis- vaginal itching/discharge, favored by high pH, diabetes, antibiotics, oral contraceptives, menses, pregnancy</p> <p>Cutaneous candidiasis- skin invasion favored by warmth, moisture: inframammary folds, groin</p> <p>Oral thrush- white exudate in immunocompromised</p> <p>Esophageal candidiasis- AIDS defining illness w/ substernal chest pain, dysphagia</p> <p>Disseminated candidiasis- Immunocompromised and IVDA</p>	<p>Oval yeast w/ single bud. Can appear as “pseudohyphae” w/in tissue</p>	<p>Normal flora of upper respiratory, GI, female GU, so NO person-person transmission.</p> <p>NEVER in the blood</p>		<p>C.albicans differentiated from other <i>Candida</i> by germ tubes in serum at 37°C and chlamydospores. Skin tests are positive in normal adults, indicator of good cellular immunity.</p>	<p>Skin infections w/ topical clotrimazole, vaginitis w/ imidazole suppositories, oral thrush w/ “swish ‘n swallow” nystatin, systemic candidiasis w/ amphotericin B</p>

Cryptococcus neoformans (yeast only)

<p>Usually asymptomatic, can cause pneumonia, bone/skin granulomas. Dissemination causes cryptococcal meningitis, subacute.</p>	<p>Oval budding yeast w/ wide polysaccharide capsule (India ink stain)</p>	<p>Soil w/ pigeon crap. (Think: cryptoCOCCUS= pigeon CACA)</p>	<p>Humans inhale Yeast</p>	<p>CSF culture, cryptococcal antigen test, India Ink stain</p>	<p>Meningitis takes 6+ months of amphotericin B, Flucytosine Document care via serial lumbar punctures</p>
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Aspergillus fumigatus (mold only)

<p>Invasive necrotizing pneumonia in AIDS, Molds grow in pulmonary cavities and produce aspergilloma (FUNGUS BALL), requiring surgery. Can also induce allergic bronchopulmonary aspergillosis, type I hypersensitivity rxn like asthma.</p> <p><i>A.flavus</i>- grows on cereal or nuts produces aflatoxins (toxic, carcinogenic to liver)</p>	<p>Septate hyphae, V-shaped branches. Conidia form radiating chains. (compare w/ <i>mucor/rhizopus</i>)</p>	<p>Saprophytic molds EVERYWHERE!</p>	<p>Transmission by airborne conidia colonize and invade abraded skin, wounds, burns, ear, cornea</p>	<p>Sputum culture, or Fungus Ball on CXR or CT</p>	<p>Amphotericin B</p>
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Mucor/Rhizopus (mold only)

<p>Rhinocerebral mucormycosis- associated w/ diabetes, caused by infection of nasal mucosa with invasion of sinuses/orbit. Molds proliferate in walls of blood vessels.</p> <p>(Think MUCOR/Rhizopus invades MUCOSA)</p>	<p>Nonseptate hyphae w/ broad irregular walls and right angle branches (compare w/ <i>aspergillus</i>) Endospores inside of sporangium</p>	<p>Saprophytic molds EVERYWHERE!</p>		<p>Biopsy</p>	<p>Amphotericin B, Surgical resection</p>
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Fungus Morphologies Chart

FUNGUS:	YEAST FORM	MOLD FORM
Tinea: (<i>Malassezia furfur</i> , <i>Exophiala weneckii</i>)	Spherical yeast	Branched Hyphae
Dermatophytoses: (<i>Microsporum, trichophyton, epidermophyton</i>)	NONE	Branched hyphae w/ macro and microconidia
Sporotrichosis	Round or cigar shaped budding yeast	Branched hyphae w/ oval conidia at tip of conidiophores (“daisies”)
Coccidioides	“Spherule” containing endospores	Branched hyphae w/ alternating arthrospores and empty cells
Histoplasma	Oval budding yeast INSIDE macrophages	Branched hyphae w/ macro and microconidia
Blastomyces	Round yeast w/ doubly refractive wall , single broad based bud	Branched hyphae w/ small conidia
Paracoccidioides	Round yeast w/ thick wall and multiple buds	Branched hyphae w/ small conidia
Candida	Oval yeast w/ single bud and “psuedohyphae” <i>C. albicans</i> germ tubes w/ chamydospores at 37°C	NONE
Cryptococcus	Oval budding yeast w/ polysaccharide capsule	NONE
Aspergillus	NONE	V-shaped septate hyphae w/ radiating chains of conidia
Mucor/Rhizopus	NONE	Right-angle branched nonseptate hyphae w/ sporangium

