fungi [created by Paul Young 02/10/07]

Cryptococcus

- C. neoformans and C. gattii are the most important
- an encapsulated organism
- cause of meningitis and pneumonia in the immunocompromised
- India ink staining and CSF and blood crytococcal antigen tests are useful

Mucormycosis

- caused by Zygomycetes fungi - Rhizopus, Rhizomucor, Absidia spp
- broad, non-septate hyphae that branch at 90 degrees
- risk factors are:
(i) chronic respiratory acidosis,
(ii) poorly controlled diabetes,
(iii) immunosuppression,
(iv) renal failure,
(v) chelation therapy with increased serum iron levels,
(vi) burns,
(vii) intravenous drug use
- invasive rhinocerebral, orbital or disseminated black lesions
- usually resistant to azoles (except posaconazole)

Aspergillus fumigatus

- acute angle, branching, septated, non-pigmented hyphae
- associated diseases include:
(i) asthma (type 1 hypersensitivity to spores)
(ii) allergic bronchopulmonary aspergillosis (type 3 hypersensitivity with recurrent pneumonia & bronchiectasis)
(iii) aspergilloma (mycetoma)
(iv) invasive aspergillosis
- serum galactogamman (an Aspergillus antigen) may aid diagnosis
- CT may show halo and crescent air signs with aspergilloma and invasive disease

Pneumocystis jiroveci

- previously known as P. carinii & renamed recently as well as reclassified as a fungus on the basis of nucleic acid and biochemical features
- classically causes pneumonia in the immunosuppressed
- may respond to treatment with cotrimoxazole, dapsone or atovaquone
- concomitant corticosteroids should be used in patients with HIV infection and significant hypoxaemia

treatment of systemic candidiasis

- For severe sepsis due to Candida species, initiate treatment with amphotericin until the identity of the Candida species is confirmed.
- If the infection is related to an intravascular catheter, the catheter should be removed to prevent relapse. Initially, use:
amphotericin B desoxycholate 0.5 to 1 mg/kg IV, daily.
- For proven Candida albicans and other susceptible strains, use:
fluconazole 400 mg (child: 10 mg/kg up to 400 mg) IV, daily.
- Following clinical improvement with either IV amphotericin or IV fluconazole, for susceptible species, continue treatment with:
fluconazole 400 mg (child: 10 mg/kg up to 400 mg) orally, daily for a total of at least 14 days.
- Some Candida (eg C. krusei, C. glabrata) are resistant to fluconazole; voriconazole or caspofungin may be suitable alternatives.
- Neutropenic patients with hepatosplenic candidiasis need prolonged therapy

Candida spp

- Candida albicans is asexual, dimorphic with hyphae, pseudohyphae & chlamydospores
- Other species with increased resistance patterns and varied morphology are
(i) C. topicalis
(ii) C. krusei
(iii) C. glabrata
(iv) C. lusitanae
(v) C. parapsilopsis
- Azole resistance is increasing with C. albicans and is well estabilised for C. krusei & C. glabrata
- amphotericin resistance is a problem with C. lusitanae but it is sensitive to azoles
- Invasive candidiasis is highly likely if:
(i) cultured from the blood (especially two at different times of collection)
(ii) cultured from a sterile site
- Invasive candidiasis is suggested by:
(i) culture from tissue or burn wound biopsies
(ii) culture from two non-contiguous sites
(iii) identified species is non commensal

risk factors for invasive Candidaemia

- the incidence of candidaemia amongst unselected ICU patients is only 0.5–2%.
- Invasive fungal infections in such patients are associated with crude mortality rates of 30–40%,
(i) such as recent abdominal surgery,
(ii) gastrointestinal tract perforation,
(iii) dialysis,
(iv) central venous catheterization,
(v) total parenteral nutrition,
(vi) broad-spectrum antibiotic therapy and
(vii) colonization with Candida species

Estimated risk	Examples	Incidence without fluconazole prophylaxis (IFIs/100 patients)	Incidence with fluconazole prophylaxis (IFIs/100 patients)	Number avoided/ 100 patients	Number needed to treat to prevent one episode of IFI[a]
Low (≤1%)	absence of risk factors[b]	1	0.47	**0.53**	188 (147–345)
Average (2%)	unselected ICU population[b]	2	0.94	**1.06**	94 (74–172)
High (11%)	one of diabetes, new onset haemodialysis, TPN prior to ICU entry or broad-spectrum antibiotics[b]	11	5.2	**5.8**	17 (13–31)
High (17%)	one of diabetes, new onset haemodialysis or TPN prior to ICU entry[c]	17	8.0	**9.0**	11 (9–20)
Highest (20%)	one of diabetes, new onset haemodialysis or TPN prior to ICU entry, and broad-spectrum antibiotics[c]	20	9.4	10.6	9 (7–17)

IFI, invasive fungal infection; TPN, total parenteral nutrition.

arguments against prophylaxis with fluconazole

(i) may predispose to infection or colonization with azole resistant fungal species
(ii) drug interactions with fluconazole
(iii) hepatotoxicity of fluconazole
- Certain Candida species, such as C. glabrata and C. krusei, and most filamentous fungi, including Aspergillus species, are intrinsically or relatively fluconazole-resistant

arguments for prophylaxis with fluconazole

- antifungal prophylaxis with fluconazole reduces invasive fungal infections and total mortality across a broad range of clinical settings in non-neutropenic critically ill patients in a systematic review.