The Fungi of Medical Importance

Chapter 22
Fungi as infectious agents

- molds & yeasts are widely distributed in air, dust, fomites & normal flora
- humans are relatively resistant
- fungi are relatively nonpathogenic
- of the 100,000 fungal species, only 300 have been linked to disease in animals
- fungi are the most common plant pathogens
- human mycoses are caused by true pathogens and opportunistic pathogens
<table>
<thead>
<tr>
<th></th>
<th>True Pathogenic Infections</th>
<th>Opportunistic Infections</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Degree of Virulence</strong></td>
<td>Well developed</td>
<td>Limited</td>
</tr>
<tr>
<td><strong>Condition of Host</strong></td>
<td>Resistance high or low</td>
<td>Resistance low</td>
</tr>
<tr>
<td><strong>Primary Portal of Entry</strong></td>
<td>Respiratory</td>
<td>Respiratory mucocutaneous</td>
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<tr>
<td><strong>Nature of Infection</strong></td>
<td>Usually primary, pulmonary, and systemic; usually asymptomatic</td>
<td>Varies from superficial skin to pulmonary and systemic; usually symptomatic</td>
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<tr>
<td><strong>Nature of Immunity</strong></td>
<td>Well-developed, specific</td>
<td>Weak, short-lived</td>
</tr>
<tr>
<td><strong>Infecting Form</strong></td>
<td>Primarily conidial</td>
<td>Conidial or mycelial</td>
</tr>
<tr>
<td><strong>Shows Thermal Dimorphism</strong></td>
<td>Strongly</td>
<td>Not usually</td>
</tr>
<tr>
<td><strong>Habitat of Fungus</strong></td>
<td>Soil</td>
<td>Varies from soil to flora of humans and animals</td>
</tr>
<tr>
<td><strong>Geographic Location</strong></td>
<td>Restricted to endemic regions</td>
<td>Distributed worldwide</td>
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</table>
(1) When fungal spores from the environment gain entrance to a warm-blooded animal, they germinate into yeasts and remain in this phase in the host.

(2) Yeast cells leaving the animal host return to the environment and revert to the sporulating hyphal state. These conversions can be demonstrated on artificial media in the laboratory.
Mycoses

- most fungal pathogens do not require a host to complete their life cycles and infections are not communicable
- dermaphytes & *Candida sp* naturally inhabit human body & are transmissable
- dermaphytoses most prevalent
- most cases go undiagnosed or misdiagnosed
- systemic, subcutaneous, cutaneous or superficial infections
Levels of invasion

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Systemic mycoses caused by true pathogens

- *Histoplasma capsulatum*
- *Coccidioides immitis*
- *Blastomyces dermatitidis*
- *Paracoccidioidomycosis brasiliensis*
Histoplasma capsulatum

- cause histoplasmosis
- typically dimorphic
- distributed worldwide, most prevalent in eastern & central regions of US (Ohio River Valley) KENTUCKY
- grow in moist soil high in nitrogen content
- inhaled conidia produce primary pulmonary infection that may progress to systemic involvement of a variety of organs & chronic lung disease
- amphotericin B, ketoconazole
Histoplasma capsulatum

(a) A colony at 25°C produces a fuzzy mycelium.

(b) A yeast colony (37°C) is dense and waxy.
Histoplasma capsulatum

(a) Soil containing bird droppings is whipped up by the wind.

(b) Microconidia are inhaled.

(c) The patient develops mild pneumonitis, which might recur.

(d) In the tissue phase of infection, the yeast phase develops, is phagocytosed, and multiplies by budding intracellularly. Most patients recover without complications.

(e) In some cases, phagocytes enter the blood and cause disseminated disease in a number of organs.
Candida albicans

- widespread yeast
- infections can be short-lived, superficial skin irritations to overwhelming, fatal systemic diseases
- budding cells of varying size that my form both elongate pseudohyphae & true hyphae
- forms off-white, pasty colony with a yeasty odor
Candida albicans

- Normal flora of oral cavity, genitalia, large intestine or skin of 20% of humans
- Account for 80% of nosocomial fungal infections
- Account for 30% of deaths from nosocomial infections
Candida Albicans infections

- **Thrush** – occurs as a thick, white, adherent growth on the mucous membranes of mouth & throat

- **Vulvovaginal yeast infection** – painful inflammatory condition of the female genital region that causes ulceration & whitish discharge

- **Cutaneous candidiasis** – occurs in chronically moist areas of skin and burn patients
Candida albicans
Candida albicans
Pneumocystis carinii

- a small, unicellular fungus that causes pneumonia (PCP), the most prominent opportunistic infection in AIDS patients
- this pneumonia forms secretions in the lungs that block breathing & can be rapidly fatal if not controlled with medication
- pentamidine & cotrimoxazole
Pneumocystis carinii
Fungal allergies & mycotoxicoses

- Fungal spores are common sources of atopic allergies

- Fungal toxins lead to mycotoxicoses usually caused by eating poisonous or hallucinogenic mushrooms
Examples of Fungal Allergies & Mycotoxicoses

1. asthma, often occurring in seasonal episodes
2. farmer’s lung, a chronic & sometimes fatal allergy of agricultural workers exposed to moldy grasses
3. teapicker’s lung
4. bagassosis, a condition caused by inhaling moldy dust from processed sugarcane debris
5. bark stripper’s disease caused by inhaling spores from logs
Yeast, n.

Gregarious single-celled organism whose first evolutionary priority was to develop the capacity to synthesize alcohol. Usually well behaved, but can become rowdy in groups.

Once again, war breaks out in the middle yeast.