



Genito-Urinary System

Candidiasis & Candida albicans

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Candida albicans

- *C. albicans* grows in multiple morphologic forms, most often as a **yeast** with budding by formation of blastoconidia.
- *C. albicans* is also able to form **hyphae** triggered by changes in conditions such as temperature, pH, and available nutrients.
- When observed in their initial stages when still attached to the yeast cell, these hyphae look like sprouts and are called **germ tubes**.

- Other elongated forms with restrictions at intervals are called **pseudohyphae** because they lack the parallel walls and septation of the true hyphae.
- **Chlamydoconidia** develop from hyphae in culture under certain cultural conditions.
- The *C. albicans* cell wall is made up of a mixture of the polysaccharides mannan, glucan, and chitin alone or in complexes with protein.
- The exact composition of the cell wall and surface components varies under different growth and morphologic conditions.

CANDIDIASIS

- Candidiasis occurs in **localized** and **disseminated** forms.
- **Localized disease** is seen as **erythema and white plaques** in moist skin folds (**diaper rash**) or on mucosal surfaces (**oral thrush**). It may also cause the itching and thick white discharge of **vulvovaginitis**.
- **Deep tissue** and **disseminated disease** are limited almost exclusively to the **immuno-compromised**.
- **Diffuse pneumonia** and **urinary tract** involvement are especially common.

EPIDEMIOLOGY

- *C. albicans* is a common member of the oropharyngeal, gastrointestinal, and female genital flora.
- Infections are **endogenous** except in cases of direct mucosal contact with lesions in others (eg, through sexual intercourse).
- Although *C. albicans* is a common cause of nosocomial infections, the fungi are also derived more frequently from the **patient's own flora**.
- Invasive procedures and indwelling devices may provide portal of entry, and the number of *Candida* may be enhanced by the use of antibacterial agents.

PATHOGENESIS

- Because *C. albicans* is regularly present on mucosal surfaces, disease implies a change in the organism, the host, or both.
- Shift from yeast to hyphae is associated with enhanced pathogenic potential of *C. albicans* (invasion). This switch is controlled in vitro by the manipulation of environmental conditions.
- *C. albicans* **hyphae** have the capacity to **form strong attachments** to human epithelial cells, mediated by a surface mannoproteins; hyphal wall protein (Hwp1) found only on surface of germ tubes and hyphae & extracellular matrix.

- Hyphae also secrete proteinases and phospholipases that are able to digest epithelial cells and facilitate invasion.
- *C. albicans* has protein surface receptors that bind the C₃ component of complement in an antiopsonic manner.
- **Antimicrobics** and **immunosuppression** increase risk of local and invasive infection.
- **Mechanical disruptions of the mucosa** (indwelling devices) may enhance the invasion process by exposing *Candida* binding sites in the ECM.
- **Diabetes mellitus** also predisposes to *C. albicans* infection.

IMMUNITY

- Both humoral immunity and cell-mediated immunity are important in defense against *Candida* infections.
- **Opsonized yeast** forms are killed by PMNs, the naturally occurring **antimannan IgG** is able to activate the classical complement pathway and facilitate the alternate pathway.
- Hyphal forms are too large to be ingested by PMNs, but they can still kill fungi by attaching to the hyphae and discharging metabolites generated by the oxidative metabolic burst.

- A **deficit in neutrophils** or **neutrophilic function** is the most common correlate of serious *C. albicans* infection.
- Compromised CMI is associated with progressive infection.
- *Candida* cell wall mannan has been shown to play an immunoregulatory function by downregulating cell-mediated immune responses.
- Balance between TH1- and TH2- mediated cytokine responses is necessary to enhance resistance against infection & chronic disease respectively.

CANDIDIASIS

CLINICAL ASPECTS

MANIFESTATIONS

- **Superficial invasion** of the m. membranes produces a usually **painless, white, cheesy plaque** called **thrush** that is loosely adherent to the mucosal surface.
- **Vaginal candidiasis**, produces a **thick, curd-like discharge** and **itching** of the vulva. Vaginitis may be recurrent.
- **Skin infections** occur in **crural folds** and other areas in which **wet, macerated skin** surfaces are opposed.

- **Chronic mucocutaneous candidiasis** is associated with specific T-cell defects.
- Inflammatory patches similar to thrush may develop in the esophagus and intestine with or without associated oral candidiasis.
- **Urinary tract infections** are ascending or hematogenous may produce cystitis, pyelonephritis, abscesses, or expanding fungus ball lesions in the renal pelvis.
- **Endophthalmitis** appears as white cotton on the retina. Endophthalmitis and infections of other eye structures can lead to blindness.

DIAGNOSIS

- **KOH** and **Gram smears** of superficial lesions show **budding yeast** and **hyphae**.
- **Cultures** from specimens such as sputum run the risk of contamination from the normal flora or a superficial mucous membrane lesion. Lung involvement requires a direct aspirate, biopsy, or bronchoalveolar lavage.
- Deep organ involvement is difficult to prove without a **direct aspirate or biopsy**.
- Even positive blood cultures are interpreted with caution. **Endocarditis** may **require arterial cultures**.
- Immunodiagnostic procedures are not routine.

TREATMENT

- *C. albicans* is usually susceptible to **nystatin**, **amphotericin B**, **flucytosine**, and the **azoles**.
- Topical nystatin or azoles generally used for the treatment of superficial lesions.
- Measures to **decrease moisture** and **chronic trauma** are important adjuncts in treating skin infections.
- Deeper infections may resolve spontaneously with elimination or control of predisposing conditions, as an infected catheter or control of diabetes. Amphotericin B, flucytosine, and azoles for invasive disease