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Adherence mechanisms of *Candida albicans*

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Abstract: The yeast *Candida albicans* is an opportunistic fungal pathogen that is capable of inducing a range of superficial and systemic diseases in the immunocompromised host. Although it displays a variety of virulence factors, one — the ability to adhere to host tissue — is considered essential in the early stages of colonisation and tissue invasion. Adherence is achieved by a combination of specific (ligand–receptor interactions) and non-specific (electrostatic charge, van der Waals forces) mechanisms which allow the yeast to attach to a wide range of tissue types and inanimate surfaces. Conventional methods for treating disease cause by *C. albicans* rely upon the use of antifungal drugs designed to kill the yeast or arrest its growth. An alternative approach, aimed at disrupting the adherence of the yeast to host tissue in cases of superficial infection, may have potential for controlling disease, particularly in situations where the unattached fungal cell can be removed from the affected site, either by the flushing action of the oropharynx or by the production of mucus in the vagina.

Key words: Adherence. Adhesins. Antifungal agents. *Candida*. Virulence.

Introduction

The yeast *Candida albicans* is an opportunistic fungal pathogen that may be present as a normal component of the body microflora. It is responsible for a variety of diseases in the immunocompromised or immunosuppressed host, ranging from the superficial (e.g. oral or vaginal candidosis) to the systemic¹ — the former are generally responsive to treatment with a range of antifungal drugs but the latter can be difficult to treat and may result in death.

Although frequently encountered as the aetiological agent of disease in immunocompromised patients, *C. albicans* is responsible for vulvovaginal candidosis (one of the most common vaginal infections), which affects up to 75% of women at some point in their life, and may affect 5–12% of the female population as a chronic recurring condition.² Conventional means of control rely upon the use of azole or polyene drugs in a wide range of formulations. Systemic infection is often treated by amphotericin B but treatment may be hindered by the adverse side-effects associated with this drug.^{3,4}

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Virulence factors of *Candida albicans*

C. albicans displays a variety of virulence factors which aid colonisation and persistence in the body.⁵ One of the most important of these is the ability to adhere to host tissue, using a variety of mechanisms, permitting the yeast to anchor at a site and the process of tissue colonisation to commence.

C. albicans can exist in two morphologically distinct forms — budding blastospores or hyphae^{5,6} — and can interconvert between each; however, it is usually seen in both morphological forms⁷ in tissue samples. Originally, it was thought that the hyphal form was required for tissue invasion, but this is no longer thought to be true. Hyphae are capable of thigmotropism (contact sensing), which may help to find the line of least resistance between and through layers of cells in tissue;⁸ however, *C. albicans* produces a range of extracellular enzymes that facilitate adherence and/or tissue penetration.

Phospholipase A, B, C and lysophospholipase may damage host-cell membranes and facilitate invasion,⁹ and acid proteinase — which has been shown to aid adherence and invasion — plays an important role in degrading immunoglobulins (IgG and IgA).¹⁰ Acid proteinase activity is optimal at low pH and this may