Candida albicans adhesion to central venous catheters: Impact of blood plasma-driven germ tube formation and pathogen-derived adhesins.

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Abstract

Candida albicans-related bloodstream infections are often associated with infected central venous catheters (CVC) triggered by microbial adhesion and biofilm formation. We utilized single-cell force spectroscopy (SCFS) and flow chamber models to investigate the adhesion behavior of C. albicans yeast cells and germinated cells to naïve and human blood plasma (HBP)-coated CVC tubing. Germinated cells demonstrated up to 56.8-fold increased adhesion forces to CVC surfaces when compared to yeast cells. Coating of CVCs with HBP significantly increased the adhesion of 60-min germinated cells but not of yeast cells and 30-min germinated cells. Under flow conditions comparable to those in major human veins, germinated cells displayed a flow directional-orientated adhesion pattern to HBP-coated CVC material, suggesting the germ tip to serve as the

major adhesive region. None of the above-reported phenotypes were observed with germinated cells of an als3Δ deletion mutant, which displayed similar adhesion forces to CVC surfaces as the isogenic yeast cells. Germinated cells of the als3Δ mutant also lacked a clear flow directional-orientated adhesion pattern on HBP-coated CVC material, indicating a central role for Als3 in the adhesion of germinated C. albicans cells to blood exposed CVC surfaces. In the common model of C. albicans, biofilm formation is thought to be mediated primarily by yeast cells, followed by surface-triggered the formation of hyphae. We suggest an extension of this model in which C. albicans germ tubes promote the initial adhesion to blood-exposed implanted medical devices via the germ tube-associated adhesion protein Als3.

Involved units

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