Characterization of hyper- and hypo-filamenting strains of Candida albicans

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Candida albicans is a fungus with the ability to exist as an opportunistic pathogen. It is found naturally in about seventy percent of the healthy human population and is generally harmless. Candida albicans, however, has the potential to cause a variety of skin and tissue infections, known as Candidiasis. If Candida albicans enters the bloodstream (a severe infection known as Candidemia), it invades the internal organs in the body and has a mortality rate of about 40%.1 The risk of suffering from these infections increases in hospitalized patients who are immunocompromised or immunodeficient, such as individuals with HIV or AIDS.2 There are various virulence factors that allow C. albicans to become invasive. One of these factors is Candida albicans’ ability to change morphologies.

C. albicans is a polymorphic fungus that has the ability to transition into three different forms: yeast, pseudohyphae, and hyphae. The yeast form is thought to be important for the spreading of C. albicans, while the hyphal form has the ability to penetrate and damage host cells.3 Aside from serving as a transitional state, the role of the pseudohyphae is not well understood.4 These different morphologies are induced depending on environmental cues such as temperature, pH, and nutrient availability.

In previous experiments, mouse models were used to study the pathogenesis of oral and systemic Candidiasis. From these models, over one hundred mutant strains were collected from these mouse models. These mutant strains were initially screened at 30°C on rich medium and on Spider medium (a filament-inducing medium) and classified as hypo- or hyper- filamentous based on colony morphology and compared to the parent strain.

To do a more in-depth analysis of the filamentation mutants, and to generate a catalog for future studies, the C. albicans strains were assessed at both the macro- and microscopic level under standard laboratory conditions (30°C in nutrient-rich medium) and conditions found in the human body. Each strain was tested in rich medium, low glucose medium, and Spider medium, at both 30°C and 37°C. Cell morphology was assessed using bright-field microscopy, and colony morphology was imaged on days three, five, and seven after plating to screen single-colony morphology over time compared to the parental strain. In addition, the ability to initiate hyphal formation was examined by a germ tube formation assay. The length and width of about 100 hyphae was measured and compared to the parental strain.

In the future, the data from each strain will be paired with the parental strain and tested for statistical significance. Strains will then be paired into groups based on their hypo- or hyper-filamentous properties and will be sequenced to look for mutations or adaptation mechanisms.

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