Investigating the role of protein Slr1 in mRNA transport of pathogenic yeast *Candida albicans*

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Candida albicans is a common commensal fungus that often lives harmlessly in the skin and mucous of humans. However, it is also an opportunistic pathogen that can cause various infections including life-threatening bloodstream infections in immunocompromised patients. The ability of *Candida albicans* to switch between two different shapes, a round budding yeast form and an extended, filamentous hyphal form, has been linked to its virulence (Lo et al., 1997; Saville et al., 2003). The hyphal form contains proteins that aid in host cell adherence and invasion (Dalle et al., 2010; Filler et al., 1995). One way such proteins can get to the hyphal tip is via messenger RNA (mRNA) transport. mRNA carries the genetic instructions from DNA needed to synthesize a protein. mRNA transport is the process of moving mRNAs from the nucleus to a particular target location where proteins are needed, such that the proteins can be then made using mRNA.

The mRNA transport mechanism in baker's yeast is well-established. The She2 protein binds to mRNA in the nucleus and moves the mRNA to the cytoplasm to bind to She3 protein (Böhl et al., 2000; Long et al., 2000). Myo4 is a myosin motor protein that directly transports the mRNA-She3 complex to the hyphal tip along actin filaments (Böhl et al., 2000; Long et al., 2000). The mRNA transport mechanism in *Candida albicans* still remains largely unknown. *Candida albicans* has a She3 ortholog as well as Myo2 instead of Myo4 as the myosin motor (Elson et al., 2009). However, there is no She2 ortholog in *Candida albicans* (Elson et al., 2009). Therefore, a novel RNA-binding protein may be present to replace the function of She2 protein. One possible candidate is SR-like RNA-binding protein 1 or Slr1.

This summer my main research goal was to investigate whether Slr1 is required for *ASH1* mRNA to be transported to the hyphal tip via the She3-mRNA transport complex. In order to visualize the localization of *ASH1* mRNA in the absence and presence of Slr1, I used a technique called fluorescent in-situ hybridization or FISH, which uses a probe with a fluorescent tag and a complementary DNA sequence that specifically binds to *ASH1*. We hypothesized that *ASH1* mRNA will localize to the hyphal tip in the presence of Slr1, but not in the absence of Slr1.

Our results showed hyphal tip localization of *ASH1* mRNA in approximately 12 to 16% of wildtype cells with Slr1 protein, and much less hyphal tip localization of *ASH1* mRNA in cells without Slr1 protein. We wanted to confirm that the reduced percentage of *ASH1* mRNA hyphal tip localization in cells without Slr1 protein was not due to reduced levels of *ASH1* mRNA expression in cells without Slr1 protein. Therefore, we measured *ASH1* mRNA expression levels in cells with and without Slr1 protein and found that there is not a significant reduction of *ASH1* mRNA expression in cells without Slr1 compared to cells with Slr1. In addition, we further optimized the FISH technique by testing different hyphal growth times (1 hour, 2 hours, 3 hours) and determined that the 1-hour hyphal growth time gives us the highest percentage of hyphae with hyphal tip localization of *ASH1* mRNA. Although these results support our hypothesis, future experiments should be conducted to confirm these results and investigate alternative candidate proteins other than Slr1 that may replace the role of She2 protein.

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