The Effects of Stress on Expression of Pin3 in *Candida albicans*

Matthew Morales, 2025

Candida albicans is an opportunistic pathogen that is normally harmless to its human hosts, however it can cause fatal yeast infections when the host is immunocompromised. *C. albicans* cells have evolved to survive within humans and the stresses caused by the host's system. and the protein Pin3 is one of *C. albicans*'s potential mechanisms for stress response, as a similar Pin3 is widely studied in baker's yeast, and it plays a role in the cell's response to stress conditions (Tuite, 2004). Cellular stress conditions such as heat shock, oxidative stress, and nutrient shortages can cause proteins to become misfolded and dysfunctional, so regulating misfolded proteins after a stress event is necessary for the cell's survival (Gibney et al., 2013). In baker's yeast these external stresses trigger a large increase in the concentration of Pin3 which regulates misfolded proteins. (Chernova et al., 2011). The absence of Pin3 in baker's yeast cells causes them to become much more sensitive to lethal heat shock (Gibney et al., 2013). This project investigated the relationships between Pin3 levels in *Candida albicans* and various growth conditions to see if .

Two types of experiments were conducted throughout the Fellowship: growth of cells with and without Pin3 under stressful conditions and measuring levels of Pin 3 protein grown in stressful conditions.

The first stress condition tested, was oxidative stress which *C. albicans* cells face when encountering host immune cells. *C. albicans* strains, with and without functional Pin3, were grown on plates containing bleach or hydrogen peroxide. After 24 and 48 hours there were not any visible differences in growth between strains with Pin3 or without Pin3. The next growth experiment screened several stress conditions by growing cells with/without expression of Pin3 for several days. After 5+ days we did not see any visible growth differences based on the presence of Pin3.

The first experiment which focused on levels of Pin3 compared the concentrations of Pin3 between different strains of *C. albicans*, and we did not see an observable difference between the various strains. The next stress condition tested was heat shock, *C. albicans* cells were exposed to 42ºC heat shock at several time intervals. Unlike Pin3 in Baker's yeast, Pin3 expression in *C. albicans* does not change when subjected to heat shock. Next, we decided to look at Pin3 expression when *C. albicans* cells are under hyphal growth instead of yeast budding. We induced hyphae with two mediums RPMI and 10% Fetal Bovine Serum, and there were observed differences in expression. Pin3 protein levels appeared to increase when cells were in hyphal growth. After replicate testing and semi-quantitative analysis of the expression levels we found that Pin3 levels increased around 1.5x when *C. albicans* were in hyphal growth. Since hyphal formation is one response to stress, our results indicate that Pin3 in *C. albicans* plays a role in regulating this stress response which differs from the role played by Pin3 in baker's yeast.

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