CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
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Project Number
S1516

Project Title
Evaluating the Role of the HOG1 and ESCRT Pathways in Host/Cell Interaction and Stress Response of Candida albicans

Abstract

Objectives/Goals
The fungus Candida albicans can enter the bloodstream in immunocompromised patients, infecting most organs of the body and resulting in disseminated candidiasis, which has a 50% mortality rate. Since current antifungal treatments are non-specific and ineffective - often hurting the host as much as they help - a more specific and targeted approach toward treating C. albicans infections can provide a much needed medical breakthrough. This project sought specific genes that could be targeted to inhibit C. albicans normal function so that fungal cells can be killed without harming human cells.

Methods/Materials
A forward genetic screen of over 150 kinase insertion mutants found that the HOG1 (High Osmolarity Glycerol) pathway and ESCRT (Endosomal Sorting Complex Required for Transport) pathway were both necessary for stress response. Further research was conducted on the ESCRT pathway in an endocytosis assay as well as a cell damage assay in order to determine its role in host/cell interaction.

Results
Both the HOG1 and ESCRT pathways were implicated in C. albicans normal stress response to the body's defense mechanisms. Furthermore, early or late gene inhibition in the ESCRT pathway severely impaired C. albicans proper interaction with host epithelial cells. Specific subcomplexes within the ESCRT pathway proved to be more important than others.

Conclusions/Discussion
Overall, either of these two biochemical pathways can be inhibited in C. albicans in order to disrupt its normal function and cause it to die. Since these genes are non-homologous in human cells, they provide specific gene targets for future medications. These discoveries will help in significantly decreasing the high mortality rate of disseminated candidiasis as well as other fungal diseases.

Summary Statement
This study determined specific gene pathways within the fungus Candida albicans that can be targeted to kill the fungus but not human cells.

Help Received
Used lab equipment at Los Angeles Biomedical Research Institute; mentored by Dr. Scott Filler; supervised by Norma Solis.