CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)

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Project Number

S1503

Project Title

Role of Septins in the Uptake of the Fungus Candida albicans by Host Cells

Abstract

Objectives/Goals

The fungus Candida albicans normally grows as a harmless commensal on the skin and mucous membranes. In hospitalized patients, C. albicans causes a severe bloodbourne infection associated with greater than 40% mortality. Investigating septin function during the invasion of the fungus C. albicans into endothelial cells may provide insight into how microbial pathogens hijack endocytosis mechanisms to invade these cells. The objectives of this experiment are to determine if septins affect N-cadherin accumulation and if septin depletion decreases C. albicans uptake. Learning more about the basic science of cell membrane dynamics will help in the development of anti-infective drugs to combat candidiasis.

Methods/Materials

Human umbilical vein endothelial cells were infected with C. albicans cells. Septins and actin microfilaments were stained by AlexaFluor immunofluorescence procedures and imaged by confocal microscropy. To establish the role of septin 7 during C. albicans uptake, endothelial cells were transfected with siRNA against septin 7, infected with C. albicans, fixed, stained with anti-septin 7 and anti-N-cadherin (a known C. albicans cell receptor) antibodies, and then imaged by confocal microscopy. In addition, the endocytosis of C. albicans by the transfected cells was quantified via a differential fluorescence assay.

Results

By confocal microscopy, septin 7 co-localized with the actin filaments that also coalesced around the organisms. Confocal microscopy revealed a 72% reduction in septin 7 accumulation around C. albicans in endothelial cells that were transfected with the septin 7 siRNA compared to the control siRNA. Confocal microscopy also revealed a 66% reduction in N-cadherin accumulation around C. albicans in these septin-depleted cells. Septin 7 knockdown by siRNA resulted in a 47±18% decrease in the number of C. albicans cells that were endocytosed by the endothelial cells.

Conclusions/Discussion

Septin 7 is necessary for C. albicans to induce its own endocytosis by endothelial cells. The link between septins and vital cell receptors such as N-cadherin explains why septins are so important for host cells to take up microbial pathogens. Endothelial cell receptors for C. albicans cannot function properly without the presence of septins in this host cell.

Summary Statement

This study focuses on discovering the intracellular processes which facilitate endocytosis of the fungus Candida albicans in order to decrease the mortality rate of the disease it causes.

Help Received

Used lab equipment at Los Angeles Biomedical Research Institute; mentored by Dr. Scott Filler; supervised by Trang Phan.