CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)

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Project Number

S0418

Project Title

Microfluidic Image Cytometry to Detect PI3K Pathway Markers in Brain Cancer

Abstract

Objectives/Goals

A new generation of anticancer drugs targets molecular pathways, yet cancer treatment still remains inefficient and is in need of further development. Macro-scaled imaging modalities rely on reductions of tumor size to determine the effectiveness of drug treatment but this takes weeks to see noticeable change. Even though patients have similar tumors, they respond differently to treatment because of their unique molecular signature. In order to quickly assess the efficacy of drug treatment and analyze the different molecular profiles, the Microfluidic Image Cytometry was utilized.

Methods/Materials

The Microfluidic Image Cytometry platform allows for single cell level detection and analysis to compare protein expressions in a cell population's response to drug treatment. Immunocytochemistry methods of antibody staining were used. U87 cells, brain cancer cells, were fixated and expression levels were detected inside a PDMS microfluidic device. Fluorescent dyes were attached to antibodies to target the PI3K pathway markers in brain cancer: EGFRvIII, PTEN, and pS6.

Results

Optimum conditions were determined by measuring fluorescence intensity levels using MetaMorph. Optimum antibody concentrations for detection of EGFRvIII, PTEN, and pS6 were established: 0.5 ug/mL, 2.5 ug/mL, and 4.5 ug/mL respectively. The U87 cells underwent rapamycin drug treatment and pS6 levels served to measure the effective concentrations, 2nM to 20nM, needed in order to inhibit pS6 in the PI3K pathway.

Conclusions/Discussion

The Microfluidic Image Cytometry is an effective and quick method for analysis of cancer treatment response because of its small sample volume, large-scale analysis, and single cell precision.

Summary Statement

The focus this project is using a microfluidic image cytometry device to analyze the molecular profile of cancer patients and the drug response to treatment.

Help Received

Used the lab equipment at University of California, Los Angeles (UCLA) under the supervision of Dr. Hsian-Rong Tseng.