CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
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Project Number
S0424

Project Title
Micropathology Lab Device for Detecting Molecular Lesions of Glioblastoma

Abstract

Objectives/Goals
Current techniques for cancer diagnosis such as imaging (MRI) and tissue examinations are inadequate because they can detect distinguishing morphological patterns, but lack the capability to accurately identify specific intercellular interactions causing a particular cancer. Generalized models for diagnosis lead to ineffective therapies and high mortality. The objective of this project is to develop a system capable of detecting and analyzing cancer signaling pathways for specific diagnoses and targeted treatments.

Methods/Materials
Glioblastoma, the most lethal form of brain cancer, was the model used to integrate a systems biology approach with microfluidics. The device was fabricated by soft-lithography. Antibodies were immobilized onto the channels of the device through surface modification processes. Transfected and untransfected U87 lysates were labeled with fluorescent probes and passed through the device. Expression levels of EGFRvIII, PTEN, mTOR, p-Akt, and p-S6 from the PI3K pathway of Glioblastoma were analyzed under a fluorescent microscope.

Results
PTEN was detected and showed to be 19.7 fold greater in intensity than in lysates without PTEN. EGFRvIII was also identified and showed detection efficiency two times greater than the controls. Phosphorylated downstream signaling proteins such as mTOR, Akt, and S6 were efficiently analyzed as well. The results were validated with western blots.

Conclusions/Discussion
This newly developed device can efficiently analyze protein interactions from cancer signaling pathways. Proteins such as PTEN, EGFRvIII, p-Akt, p-mTOR, and p-S6 from the most malignant form of brain cancer were efficiently detected on chip. The Micro Pathology Lab Device will ultimately improve cancer diagnostics, accelerate drug screening clinical trials, and aid in the development of targeted therapies.

Summary Statement
A microfluidic device for detecting and analyzing cancer cell-signaling pathways was developed to improve the specificity of diagnostics and treatment.

Help Received
Used lab equipment at the University of California, Los Angeles under the supervision of Dr. Tseng and Dr. Sui.