CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY

Name(s)

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Project Number

38306

Project Title

In Vitro Analyses of Trace Element Composition in a Metastatic Breast Cancer Model Using X-Ray Fluorescence

Abstract

Objectives/Goals

Our goal was to determine whether there is a significant difference in element composition between metastatic and non-metastatic breast cancer cells through the use of X-Ray Fluorescence (XRF). A detected difference would arm physicians with an indicator of tumor progression, site of metastasis, and more effective formulation of treatment plans.

Methods/Materials

Two cell lines were used: MDA-MB-231-BO (osteotropic) and MDA-MB-231 PA (localized). Samples and controls were gathered (centrifuged pellet, supernatant, spheroids as samples; distilled water, FBS, DMEM as controls). Using ImageJ analysis software, our spheroid protocol was optimized. A novel spheroid harvesting method was designed for placement of samples in kapton tape holder. Gaussian peak fitting was then performed on XRF spectra.

Results

All trials found that the osteotropic cells consistently accumulated more Fe and Pb with all but one of these differences being statistically significant at the 5% level and most having $p<0.0001$.

Conclusions/Discussion

Previous studies have found that increased Fe and Pb cause tumor proliferation, substantiating our results. At the time of writing this abstract, genomic analysis is being performed to determine gene expression which would explain the increased Fe and Pb in MDA-MB231 BO. We believe the potential changes in gene expression and elemental accumulation would allow a more accurate assessment of the prognosis of the disease and life expectancy of the patient.

Summary Statement

Our project is an in vitro comparison of the elemental composition of metastatic and non-metastatic breast cancer cells in hopes of creating efficient diagnostics that physicians may use in practice.

Help Received

This project was conducted at California State University Fresno. The project idea (proposed by Dr. Jason Bush as part of the UCSF Fresno Summer Biomedical Internship) was implemented and extended over the course of nearly a year by the authors. XRF was carried out under the guidance of Dr. Mihai Gherase.