CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)
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Project Number
S1813

Project Title
Characterizing the Role of Arachidonic Acid-Derived Eicosanoids in Breast Cancer

Abstract

Objectives/Goals
This project was done in an attempt to answer two questions: Were these inflammatory molecules, and thus the inflammatory response, also associated with breast adenocarcinomas? Eicosanoids can be produced via diverse metabolic pathways. However, only a few have significant output of a variety of eicosanoids -- and one, the arachidonic acid pathway, is a particularly appealing pathway because it involves the inducible (generally inactive) enzyme cycloxygenase-2 (COX-2). Was the notorious arachidonic acid pathway responsible for any elevated eicosanoid output?

Methods/Materials
The procedure I devised to determine the relationship between arachidonic acid (AA) and eicosanoid production can be split up into three major subprocedures. 1) A cancerous (MCF7) and a noncancerous (MCF10a) cell line were cultured and tested for viability at various concentrations of AA. 2) The two cell lines were given arachidonic acid treatments at 200 and 250 micromolar concentrations, and the pellet and media eicosanoids were collected. 3) Eicosanoid production was characterized and quantified through HPLC analysis.

Results
The MCF10a cell line exhibited a strong dose-response relationship. The MCF7 cell line did not--its eicosanoid production without the input of any arachidonic acid was already very high. This dose-response relationship in the MCF10a cell line was reflected in both cellular eicosanoid levels--measured from the pellet--and secreted eicosanoid levels--measured from the media.

Conclusions/Discussion
That I was able to isolate such a significant amount of eicosanoids from the MCF7 cell line is both anticipated and explanatory. It tells us that inflammation plays a key role in the maintainable of growth in this particular adenocarcinoma. Not only do the cells exhibit the lack of density-dependent regulation characteristic of the majority of cancer cells, these in particular bolster their proliferation capabilities through the secretion of these inflammatory eicosanoids.

Summary Statement
My project was to compare the effects of a particular type of inflammation on normal breast endothelial (MCF10a) and breast adenocarcinoma (MCF7) cell lines, and thereby determine whether cancer cells use it to proliferate.

Help Received
Participant in research internship sweepstakes (UTEP/CRP), used lab equiptment at the Das Research Group at University of Texas, El Paso. They taught me to use many of the lab equiptment that I would need to conduct my research.