CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY

Name(s)
Alicia E. Lee

Project Number
S0416

Project Title
Manipulation of PGE(2) Levels with Various Cytokines of Thyroid Associated Ophthalmopathy

Abstract

Objectives/Goals
Graves# Disease is a form of hyperthyroidism often accompanied by Thyroid Associated Ophthalmopathy (TAO), an autoimmune-mediated inflammation of the extraocular connective tissue. Despite numerous studies to locate the specific factors that regulate the swelling and produce an effective cure, neither of these goals has been achieved. Recently, scientists discovered that Prostaglandin E(2) (PGE(2)) is present in significantly increased levels in the orbital tissues of patients with TAO, and must be an important factor in the inflammatory response around the eyes. The primary goal of this research project was to determine the mechanisms that lie behind the up-regulation of PGE(2) in patients with TAO and establish correlations among Th1 and Th2 cytokines, growth factors, and PGE(2).

Methods/Materials
I experimented with three types of cells: Graves# orbital fibroblasts, normal orbital fibroblasts, and dermal fibroblasts (control). I cultured each type of cell in petri dishes for two weeks. Then I treated these cells with each cytokine at different time intervals. I used the cytokine IL-1B, already proven to increase PGE(2) levels, as my positive control treatment. After treating the cells, I harvested my cultures, which included lysing and scraping the cells. I was able to solubilize the proteins and extract the supernatan to conduct a protein assay. Then I performed a western blot, using a PGE(2) Elisa Kit Protocol to test for PGE(2) levels.

Results
This research experiment led to significant insights concerning the mechanisms that lie behind TAO. Contrary to expectations, TGF-B was found to exhibit the potential to inhibit PGE(2). On the other hand, a significant relationship between the Th2 cytokine IL-4 and the up-regulation of PGE(2) was established. Both IL-4 and IL-1B shared many important similarities, including a sixteen-hour optimal time interval.

Conclusions/Discussion
The potential implications of these findings are considerable. Not only have we disproved a query that only Th1 cells are responsible for significant up-regulation of PGE2, but we have now identified another cytokine important for the progression of TAO. Although IL-4 has remained a rather obscure cytokine, these findings have revealed its important involvement with TAO. There must be some common link between IL-4 and IL-1B. Further studies concerning the mechanisms associated with IL-1B and IL-4 will indisputably be followed.

Summary Statement
The primary goal of this research project was to determine the mechanisms that lie behind the up-regulation of PGE(2) in patients with TAO and establish correlations among Th1 and Th2 cytokines, growth factors, and PGE(2).

Help Received
Mother drove me every week to the Harbor UCLA Research Insitute; Mr. Starodub helped me fill out my approval forms for working with human tissues; Used lab equipment at Harbor UCLA Medical Center under the supervision of Dr. Terry Smith.