CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
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Project Number
S1420

Project Title
Human Dendritic Cells as a Clinical Tool to Cure Human Brain Tumors

Abstract

Objectives/Goals
None of the currently existing therapies for glioblastoma multiforme (GBM) are curative or significantly increase the lifespan of patients. Can a more effective cure be found in utilizing the immune system? If dendritic cells (DCs) are cocultivated with allogeneic GBM tumor cells, they will show the ability to destroy the GBM cells.

Methods/Materials
A. Develop 4 different in vitro GBM cell lines from surgical resections. GBM cells grow in R-15 growth medium but normal cells die off.
B. Generate DCs from blood of 4 different patients. Through centrifugation, monocytes are enriched for, and then cultivated in AIM-V supplemented with GM-CSF and IL-4, which cause them to become DCs. Presence of DCs is verified using DC specific antibodies.
C. Killing assays: Mix dendritic cells and GBM cells labeled with radioactive isotope tritiated thymidine (H-3). Determine % GBM killed by measuring the release of H-3 into the supernatant by tumor cells after 24 hours and compare to release without addition of DCs. Reproduce 3 times per tumor cell line.
D. Visual killing assays: Label DCs green (with PKH 2 fluorescent dye) and tumor cells red (with PKH 26). Cocultivate DCs and GBM cells in an eight well chamber slide. Observe slide under a florescent microscope and search for presence of dark spots within DCs and uptake of PKH 26 by tumor cells. In addition, observe tumor cells alone.

Results
A. Radioisotope was detected in the supernatant of all 3 trials of all 4 tumor lines. None was detected in the supernatant of the tumor cells alone.
B. After just 24 hours, dark spots were visible within DCs. At 4 days no individual tumor cells remained. Tumor cells alone remained intact.

Conclusions/Discussion
The hypothesis that DCs cocultivated with allogeneic GBM tumor cells will show the ability to destroy the GBM cells was supported in vitro. This was evidenced by the presence of H-3 in the supernatant of the cocultivated cells, which indicated that the DCs had ruptured the cell membranes of the tumor cells. In addition the visual observation of tumor cells within the DCs provided evidence of engulfment. Also, the fact that no individual GBM cells remained after 4 days evidenced the destruction of the cells by the DCs. Further experiments are required to test the integrity of the observation in vivo, beginning with animal models and, if successful there, moving to humans in a clinical trial.

Summary Statement
The purpose of the project is to investigate the ability of dendritic cells to destroy GBM tumor cells; therefore their potential to serve as a cure for GBM.

Help Received
Used lab equipment at Hoag Hospital Cell Biology Lab under supervision of Dr. Patric Schiltz.Idea for project came from previous research of Dr. Schiltz. Due to safety regulations, some procedures were carried out by lab technicians under my observation. Dr. Mauzy-Melitz of UCI helped edit abstract.