CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)

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Project Number

S1701

Project Title

Drug Screening to Identify Novel Therapeutics against Glioblastoma Stem Cells: Year 2

Abstract

Objectives/Goals

Over the course of this two-year research project, I screened four different compounds (Vorinostat, Cisplatin, Cyclosporine, and Tacrolimus) to identify compounds that could form new therapeutics against human glioblastoma multiforme. Vorinostat and Cyclosporine are commonly used as chemotherapy drugs while Cyclosporine and Tacrolimus are immunosuppressant drugs. However, none of these compounds are specifically used to treat glioblastoma. I studied the effects of these compounds on the proliferation of two different lines of human glioblastoma multiforme stem cells, GBM-4 and GBM-8. Afterwards, I tested Tacrolimus and Cyclosporine against normal human neural stem cells, to determine if these drugs had the same impact they had on glioblastoma stem cells.

Methods/Materials

I plated GBM-4, GBM-8, and neural stem cells, all on separate well plates. After allowing them to grow, I added Cyclosporine, Vorinostat, Cisplatin, and Tacrolimus separately to the plates at 10 different dosages (ìM). The control wells didn't contain any dosage of drug. Then, I observed the differences in the cells¢ shapes between the different dosages and the control, under the microscope. Next, I added alamarBlue to all the cells and 24 hours later, analyzed the fluorescence intensity values to measure metabolic activity.

Results

As a result, in the cell plate with Cyclosporine, Vorinostat, and Cisplatin, the cells were completely healthy and appeared in spherical shape, in the absence of drug. The higher the dosage, the smaller the cells became and eventually the cells disintegrated and their metabolic activity dropped significantly. On the other hand, at all dosages of Tacrolimus, the cells remained spherical and healthy, and high metabolic activity was measured in all of the cells. In addition, neither Tacrolimus nor Cyclosporine exhibited harmful effects on the proliferation of normal neural stem cells.

Conclusions/Discussion

The results indicate that the immunosuppressant drug, Cyclosporine, has the potential to kill brain tumor cells without disturbing the growth of regular brain cells. This research has identified three drugs (Vorinostat, Cisplatin, Cyclosporine) that could form novel therapeutics against glioblastoma multiforme and has established a way to potentially attack and kill two stem cell lines of glioblastoma multiforme.

Summary Statement

The purpose of this project is to identify compounds that could form new therapeutics against human glioblastoma (brain tumor) stem cells without harming normal neural stem cells.

Help Received

Mentors Dr. Sandra Pastorino and Sandeep Pingle supervised this independent research project conducted at Kesari Lab at UCSD Moores Cancer Center; Parents and brother helped with setting up my board