



**CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY**

Name(s) Andrea Liu	Project Number S0516
Project Title The Role of CD114 (a G-CSF Receptor) in Medulloblastoma Cancer Stem Cells and Pathogenesis	
<p style="text-align: center;">Abstract</p> <p>Objectives It has been shown that granulocyte colony stimulating factor receptor expressing, or CD114-expressing cancer cells act like cancer stem cells in neuroblastoma and melanoma. I tested whether CD114 could be a marker for cancer stem cells in medulloblastoma and determined whether these cells demonstrate qualities and properties similar to those of other cancer stem cells.</p> <p>Methods I used the UCSD Moores Cancer Center's equipment to grow three medulloblastoma cell lines, sort the cells based on CD114 expression, and determine the confluence of these cells in response to treatment (G-CSF, chemotherapy, and a mixture of chemotherapy and G-CSF).</p> <p>Results It was found that the CD114+ cells make up a small portion of the parent cells and often repopulate at a slower rate than CD114- and parent cells, a characteristic of cancer stem cells. It was also determined that after treating cells with various chemotherapy drugs, the CD114+ cells demonstrated a higher survival rate than the CD114- and unsorted cells, indicating an increased resistance to typical chemotherapy treatment. In addition, when the medulloblastoma cells were first treated with chemotherapy, followed by G-CSF (the treatment pattern for patients), the CD114+ cells responded more robustly, increasing cell proliferation by three-fold when treated with 1 ng/mL of G-CSF, as compared to about 1.5-fold increase in viability of CD114- cells and one-fold in the parent cells.</p> <p>Conclusions It is reasonable to conclude that CD114 is a marker for cancer stem cells in medulloblastoma. In fact, it's very likely that current treatment protocols (chemotherapy with G-CSF) could very well be promoting the development of these cancer stem cells in patients with medulloblastoma, making relapse more likely.</p>	
Summary Statement I found that the granulocyte colony stimulating factor receptor CD114 is likely a cancer stem cell marker in medulloblastoma through flow cytometry, cell sorting, and analyzing these cells' reaction to various drug treatments.	
Help Received I discussed my ideas with the principle investigator I was working under, Dr. Peter Zage of UCSD, and he explained the mechanisms behind these genes' presence in medulloblastoma cells. Anything else I didn't understand I asked Dr. Megan Paul, my mentor, or looked up online.	