# CALIFORNIA STATE SCIENCE FAIR
# 2017 PROJECT SUMMARY

**Name(s)**

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**Project Number**

**S0819**

**Project Title**

## Investigating Methylation to Explain Gene Expression Patterns between Glioblastoma and Alzheimer's Disease

**Abstract**

**Objectives/Goals**

Studies show inverse correlation between Alzheimer#s Disease(AD) and Glioblastoma(GBM), both diseases of the brain. AD and GBM are both associated with epigenetic factors. Can epigenetics explain this correlation? Can cancer or AD drugs, that treat via methylation, cause higher risk of the other disease?

**Methods/Materials**

Laptop, Excel. Inputs: results of past studies done on AD, GBM and Epigenetics. These results were published in journals (Nature, JAMA), or reports from GDAC for GBM. AD inputs are genes, CpGs, DMR (differentially methylated regions) and SNPs (single nucleotide polymorphisms). GBM inputs are genes related to clinical features and CpG methylation. Genes correlated with AD and GBM are tested to see if methylation is significant for AD, GBM or both (p-value < 5E-04)

**Results**

AD and GBM genes are divided into 4 categories depending on methylation significance (AD and GBM, AD only, GBM only, none). Four genes (MGMT, PPT2, SMC1B, MTCH2) show significant methylation in both GBM and AD with CpG features (island, shore and promoter). These genes are inversely expressed in AD and GBM. MTCH2 has been studied for breast cancer and needs additional study for GBM. The genes SMC1B and PPT2 need further study to identify the role in AD/GBM.

**Conclusions/Discussion**

4 genes (MGMT, PPT2, SMC1B, MTCH2) have significant methylation and are inversely expressed in AD and GBM. MGMT, which repairs DNA damage, is shown to be correlated with AD in cerebrospinal fluid. Methylation of the promoter region of MGMT has shown direct correlation with GBM. DNA methylation in MGMT
is targeted by GBM drug, TMZ or Temozolomide. Further clinical study is needed to identify AD risk factors in patients treated by TMZ.

**Summary Statement**

My research shows significant methylation of 4 genes that have inverse correlation in Glioblastoma and Alzheimer's Disease.

**Help Received**

None. I downloaded data for GBM from GDAC and from research papers for AD. I compared the results with previously published work.