



**CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY**

Name(s) Zachary Shah; Michelle Tang	Project Number S0522
Project Title Hormonal Regulation of Hexosaminidase: Implications for Tay-Sachs Disease	
Abstract Objectives/Goals The objective is to determine how increasing concentrations of the hormones EGF and LPA affect the activity of an enzyme that is deficient in Tay-Sachs cells. Methods/Materials We grew NG108-15 cells in the lab, and we then treated cells in well plates with various concentrations of EGF and/or LPA. After treatment, we measured the amount of fluorescence of intracellular Ca ⁺⁺ using a Fluo-4 Dye Kit, and we later measured the relative fluorescence of the Hex-A enzyme using the artificial substrate MUGS. Fluorescence was measured using a microplate reader. Results When we treated the NG108-15 cells with EGF or LPA alone, the MUGS fluorescence decreased slightly when the hormone concentration increased, but the test results are questionable because the addition of AMP, a MUGS reaction stopper, greatly amplified the RFU. The combined effect of EGF and LPA at 10 uM decreased the activity of Hex-A more than EGF and LPA alone did, shown by the percent change in RFU for each test at max hormone responses, demonstrating that a combination of both hormones present will cause a down-regulation of Hex-A and could be fatal to Tay-Sachs cells. Conclusions/Discussion Our experiment analyzed the effects of growth hormones on the activity of an enzyme that is deficient in Tay-Sachs patients. From our data, we can conclude that the hormones EGF and LPA did affect the activity of Hex-A within the cells in this particular experiment. An important implication to consider from our experiment is for borderline Tay-Sachs patients. These patients have hardly enough Hex-A to breakdown the flow of GM2 gangliosides and prevent a buildup of fat in the neurons. If these patients experience situations where their EGF and LPA activity increases surrounding their neurons, it could have a negative effect on the health of their neurons, and thus doctors should help ensure that patients avoid such scenarios in order to maintain healthy neurons and minimize ganglioside accumulation.	
Summary Statement We found that the activity of the intracellular enzyme Hex-A decreases when cells are treated with a combination of growth hormones, and this could potentially harm the neurons of borderline Tay-Sachs patients.	
Help Received Dr. Rita Huff, our Science Research teacher at Valley Christian High School, supervised us through the experimental process and taught us sterile lab techniques. She also weighed out our powders and performed the initial dilutions as a safety precaution.	