CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)
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Project Number
S2313

Project Title
The Effect of Down Syndrome Cell-Adhesion-Molecule Overexpression on the Visual System and Neuronal Circuitry of Xenopus

Abstract

Objectives/Goals
Recently, the novel gene DSCAM (Down Syndrome Cell Adhesion Molecule) has been identified in the DS-critical region, which is a region on chromosome 21 thought to harbor genes responsible for some of the features of Down syndrome. However, It is not well understood in vertebral studies whether or not DSCAM specifically is actually involved in the production of the Down Syndrome phenotype. Therefore, I designed a novel behavioral assay to study the effects of DSCAM overexpression on visual avoidance behavior and neuronal branching in vertebrates, variables that are commonly abnormal in organisms with Down Syndrome.

Methods/Materials
I used electroporation and transfection to mediate the transfer of DSCAM morpholinos (which downregulate production). I then tested the visual capacitance of the tadpoles in 24 hours intervals, using my unique behavioral assay. A separate set of tadpoles was imaged following injection, and the neuronal branching was analyzed in 24 hours intervals to see if there was any change in normal dendritic development.

Results
I discovered that during early development, DSCAM overexpression leads to a 60% decrease in visual performance. More importantly, imaging reveals how overexpression leads to a 59% increase in dendritic branching during arborization, despite its role as a self-avoidance promoter.

Conclusions/Discussion
I conclude that the DSCAM gene is in fact correlated with the Down Syndrome disease, as manifested through the degraded visual performance and abnormal branching.

Summary Statement
To test the effect of DSCAM gene on the visual system in an attempt to determine correlation with Down Syndrome, I measured the effect of overexpresssion on visual behavior as well as neuronal circuit development in tadpoles.

Help Received
I received great help from Professor Cohen-Cory at UCI in assisting me during tadpole injections and operating microscopy. The procedures and analysis are all my own.