CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)
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Project Number
S0530

Project Title
Identifying a Role for Sox2 in the Development of Retinal Astrocytes for Proper Vision

Abstract

Objectives/Goals
Identifying a role for Sox2 in retinal astrocytes to advance early identification of retinal diseases

Methods/Materials
To identify a role for Sox2, two types of mice are experimented, conditional wildtype (CWT) littermates versus Sox2 conditional knockout (Sox2-CKO). Differences in properties of astrocytes between these two types of mice would indicate a variation in astrocyte morphology and a possible vision loss. Next, retinas were subsequently dissected. Each individual retina was quantified and imaged using a laser scanning confocal microscope using a 40X objective. Finally, individual z stacks were taken: each image measuring 1 micron, ranging from 36 microns to 65 microns per retina and were stitched together to create a mosaic of the entire retina.

During the experiments, measurements such as sprouting length and level of affectedness of astrocyte processes are collected.

Results
The conditional deletion of Sox2 from retinal astrocytes vastly affected astrocyte process morphology. This was evidenced by their sprouting length (the measure of abnormal astrocyte growth within the retina) and by their altered astrocyte morphology. While normal astrocytes established a starburst morphology, those in the Sox2-CKO retina frequently exhibited an abnormal affectedness of the morphology. Calculations of sprouting length confirmed a difference, in that the average sprouting length of CWT mice was 11.10 microns but the average sprouting length of Sox2-CKO mice was 17.10 microns.

Conclusions/Discussion
The absence of Sox2 results in a significant disruption in the normal organization of the retina. Among Sox2-CKO mice, all contained a higher proportion of astrocyte processes extending further into the layers of the retina past the inner nerve fiber layer. Modifications to Sox2 expression create a significant impact on the retina, resulting in disrupted synaptic networks and obstructed transmission between neurons, and affecting the overall visual capabilities. Without the correct morphological characteristics of the astrocyte, the retina is unable to respond to injury or process visual and cognitive information. Results of this project help to establish a more complete picture of how Sox2 contributes to proper vision.

Summary Statement
This project is aimed at exploring possible contributions of Sox2 in retinal astrocytes to proper vision.

Help Received
I was a participant in the California Institute of Regenerative Medicine and Research Mentorship Program at UC Santa Barbara (summer 2015).