CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)
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Project Number
S2215

Project Title
Calcium Content in Neuron Changes with Light Stimulation

Abstract

Objectives/Goals
Based on last year#s research, light at 630 nm and a power density of 3.42 J/sec cm2 slowed down an action potential along the giant axon in the earthworm.. The hypothesis for this experiment states that light alters calcium levels in the giant axon, a possible mechanism for the change in nerve conduction velocity.

Methods/Materials
This experiment is based on Calcium green, a calcium binding dye that fluoresces 14X above baseline after binding calcium in a special in vivo light detection chamber, the XENOGEN IVIS-200 system. Calcium green signal was optimized by testing serial dilutions of free calcium in buffer solutions for fluorescence. Six earthworms were dissected and injected with Calcium green and examined at three different time points: pre-injection baseline, post-injection of the calcium green dye, and after light treatment.

Results
There was an average decrease by 0.256 +/- 0.07 (SD) luminosity units after 635nm light treatment ($p<0.5$, paired t-test). The reduction in Calcium green signals suggests there was less calcium in the nerve binding the dye after light treatment.

Conclusions/Discussion
These results support the original hypothesis: red light can induce changes in intracellular calcium in the giant axon. Clinically, this experiment may lead to ways to alter nerve function and possibly, alter the sensory nerve pathways for pain and touch.

Summary Statement
I discovered that red light illumination changes the intercellular calcium content within nerves,

Help Received
I borrowed the Xenogen IVIS-200 system from the USC Molecular Imaging Center