



CALIFORNIA STATE SCIENCE FAIR 2011 PROJECT SUMMARY

Name(s) Nikhita H. Poole	Project Number 31950
Project Title The Effects of Neurotransmitter-like Substances on Cell Differentiation in Hydra	
Abstract Objectives/Goals Nerve cells in hydra influence stem cells to form additional nerves. I hypothesized that higher concentrations of neurotransmitters in the environment would simulate a higher nerve cell density because neurotransmitters are produced by nerves. Thus, with the increase in nerve signals, I expected a higher percentage of nerve cells to be produced, as the stem cells differentiate into more neurons in correlation with the apparently higher nerve density. Methods/Materials 5×10^{-3} M solutions were made of three substances: GABA, 5-HTP (a precursor of serotonin), and L-Tyrosine (a precursor of dopamine and norepinephrine). Six hydra were placed in each of these solutions, as well as in a control with normal water. After four days, the hydra were macerated and the macerate spread on microscope slides to count the cells. In a second experiment, the hydra were left in the solutions for only two days in an attempt to simulate the approximate cell cycle time of an interstitial (stem) cell. Results Those hydra treated with GABA experienced a significant increase in nerve cell percentage after four days when compared to the control. Those treated with 5-HTP experienced a significant decrease in nerve cell percentage, while those treated with L-Tyrosine did not experience any significant change. The changes in nerve cell concentration for hydra treated for just two days were not statistically significant. Conclusions/Discussion My results appear to support my hypothesis to some extent, as the influence of GABA did indeed seem to produce a significant increase in nerve cell concentration. Although 5-HTP caused a significant decrease instead, this may be due to the fact that 5-HTP is a precursor of serotonin, an inhibitory neurotransmitter, which would decrease the electrochemical activity of neurons and may instead simulate a lower nerve cell density instead of a higher one, perhaps resulting in less nerve cell differentiation. Because L-Tyrosine is merely a precursor to a neurotransmitter, the enzymes necessary to convert it may not be present in hydra, so it would not be expected to have an effect on cell differentiation. As none of the substances produced a significant difference after just two days, this time period may not have been long enough to allow the substances to have a measurable effect.	
Summary Statement I attempted to induce stem cell differentiation into nerve cells by using neurotransmitters to simulate the cellular environment known to cause differentiation.	
Help Received My biology teacher let me borrow some equipment from school, and my chemistry teacher let me use the chemicals I needed for the maceration of the hydra.	