



**CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY**

Name(s) Samuel McCabe; Barron Regan	Project Number J1715
Project Title The Effects of Docosahexaenoic Acid on Manduca sexta	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The brain of the Manduca sexta, also known as the tobacco hornworm, has olfactory and memory systems. Scientists have shown that the larvae can be conditioned to avoid specific odors. Our experiment takes these tests one step further. We added docosahexaenoic acid (DHA), an Omega-3 fatty acid, to the food of M. sexta larvae to see if they would perform better after being conditioned. We hypothesized that the group given the highest concentration of DHA would have the best memory.</p> <p>Methods/Materials We mixed three different concentrations of DHA, 0.03%, 0.53%, and 1.03%, into the food of 160 M. sexta eggs. The Control group did not receive any DHA. After the larvae matured and molted to the fifth instar, we conditioned the larvae to associate a specific odor with a mild electrical shock, eight times over an eight hour period. We then built a Y-apparatus to test whether the larvae learned to avoid the odor.</p> <p>Results The results partially supported our hypothesis. The larvae that were fed the lowest concentration of DHA, 0.03%, performed 28.6% better in the memory testing than the larvae that did not receive DHA, the Control. The Control had a 42.8% success rate in memory testing and the 0.03% had a 71.4% success rate. The larvae in the 0.53% and 1.03% concentrations died before conditioning could take place. Since we had such a poor survival rate of the larvae, we conducted a second test with another 40 eggs in each category. The Control group, with 10 larvae, was the only group to survive to the 5th instar. After conditioning and testing, the results were consistent with our first test - 40% were successful in memory testing.</p> <p>Conclusions/Discussion Thus, the results from our two tests indicate that DHA can enhance the memory of M. sexta and that the effect is dose dependent. Although there are no studies on the effects of DHA on M. sexta, there are many studies on human brains which show that DHA is vital to a high functioning memory. These studies have found that DHA enhances communication between the cells, reduces inflammation, stimulates synaptic plasticity, increases the growth of the dendrites, and increases the release of neurotransmitters.</p>	
Summary Statement We tested whether docosahexaenoic acid (DHA), an Omega-3 fatty acid, has a positive effect on the memory of Manduca sexta, also known as the tobacco hornworm.	
Help Received Grandfather helped with setting up electric shock chamber; Brother checked accuracy of calculations; Mothers supervised conditioning/testing, took pictures and edited report.	