



CALIFORNIA SCIENCE & ENGINEERING FAIR 2019 PROJECT SUMMARY

Name(s) Samika Swamy	Project Number S2113
Project Title CogniGuard: A Novel, Herb-based Treatment for Protection against Neurotoxicity from Lead Pollution	
<p style="text-align: center;">Abstract</p> <p>Objectives Institute for Health Metrics and Evaluation (IHME) estimated that in 2016 lead exposure accounted for 540,000 deaths and 13.9 million years of healthy life lost worldwide due to its long-term effects on health. IHME also estimated that in 2016, lead exposure accounted for 63.8% of global burden of idiopathic developmental intellectual disability. Exposure to lead in environment can occur through various anthropogenic sources. Lead toxicity in the body can cause serious health disorders, especially neurological, and can even result in death. It is therefore necessary to treat lead-induced neurotoxicity to counteract its detrimental effects on the human body. The goal of this project is to design and build an environmentally-friendly, low-cost, herb-based treatment to provide protection against neurotoxicity from lead.</p> <p>Methods Part1: Protection against neurotoxicity (CogniGuard) was created as a pill from 4 herb sources - Withania Somnifera, Curcuma Longa, Moringa Oleifera, and Ginkgo Biloba, including pre-treatment with papaya enzyme. 3 versions of CogniGuard were created with varying ratios of the herbs. Part2: Testing was performed with Drosophila Melanogaster as model organism. The 3 tests performed were Locomotive Behavior Test, Response to Non-Volatile Chemicals Test, and Morphological Changes Test. Plain media was used as control.</p> <p>Results After effects of lead in D. Melanogaster and improvements by usage of CogniGuard treatment were demonstrated. All CogniGuard Versions (1, 2, and 3) proved to be effective in repairing functions of D. Melanogaster that had been exposed to lead toxicity. For Locomotive Behavior, all CogniGuard versions exceeded the goal of 25% increase in number of flies reaching the target line. In Response to Non-Volatile Chemicals, lead inhibited the ability of the flies to travel towards the sucrose end - all CogniGuard versions exceeded goal of 25% increase in the distance traveled by the flies. In Morphological Changes test, lead induced effects were witnessed on the body of larva and decreased its growth, delaying the development of the fly. Maximum improvement and results closest to control group was again witnessed with CogniGuard1, followed by CogniGuard3, and finally, CogniGuard2.</p> <p>Conclusions CogniGuard Version 1 which contained W. Somnifera, C. Longa, G. Biloba, and M. Oleifera in equal parts was the leader in improving neurological abilities of D. Melanogaster that were exposed to lead neurotoxicity.</p>	
Summary Statement I created an environmentally friendly, low-cost, herb-based treatment for protection against neurotoxicity induced by environmental lead exposure.	
Help Received My STEM teacher Ms. Fallon, offered guidance and support through review and feedback, and I conducted my experiment at my school lab.	