



CALIFORNIA STATE SCIENCE FAIR 2010 PROJECT SUMMARY

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| Name(s) Autri Chattopadhyay | Project Number S1807 |
| Project Title The Role of the Dorsal Hippocampus and Prefrontal Cortex in the Onset of Nicotine Addiction in Adolescents | |
| <p style="text-align: center;">Abstract</p> <p>Objectives/Goals The goal of the project is identifying the amounts of neuronal activation in the dorsal Hippocampus and Prefrontal Cortex regions in response to nicotine. By obtaining the amounts of c-fos protein activation, one can determine the roles of each region in the onset of nicotine addiction in adolescents.</p> <p>Methods/Materials The basic structure of the study conducted involved the use of a Sprague Dawley Rat Model resembling adolescence and adulthood in humans. Rats were treated with nicotine and saline treatments (control) in both acute and chronic doses. After analyzing locomotion responses to these treatments, the brains were extracted from the mice. Using in-situ hybridization methods, the tissue was fixed and we were able to calculate the density of c-fos mRNA in various regions of the adolescent brains using autoradiography analysis.</p> <p>Results The c-fos protein is a marker of neuronal activation in the brain. Dpm/mg is a measure of optical density meaning the disintegrations per minute per milligram of tissue. In the P31 Chronic Nicotine Rats, the optical density was measured to be an average of 1925 dpm/mg in the CA1, 2015 dpm/mg in the CA3, and 2178 dpm/mg in the DG. In the prefrontal cortex region, similar results were found. The higher amount of activation in the adolescents shows a greater neural response from an adolescent brain to nicotine than the adult brain.</p> <p>Conclusions/Discussion The high amount of activation in the hippocampus, which deals with the memory and the formation of connections between contextual stimuli and reward, indicates that in the given circumstances there is a strong connection being established between nicotine use and the subsequent reward in adolescents. The fact that there is a profound neuronal response to nicotine within the prefrontal cortex suggests a correlation between personality and nicotine addiction.</p> | |
| Summary Statement I am trying to identify the roles of the Dorsal Hippocampus and Prefrontal cortex regions of the brain in the onset of nicotine addiction in adolescents. | |
| Help Received I would like to thank Dr. Frances Leslie for letting me into her lab at the University of California, Irvine and UCI MD-PhD student Jasmin Dao who mentored me in all the processes of the lab. | |