



**CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY**

Name(s) Autri Chattopadhyay	Project Number S1806
Project Title The Role of the Hippocampus in the Onset of Nicotine Addiction in Adolescents	
Objectives/Goals I wanted to determine the differences in neuronal activation in the hippocampus in adults and adolescents when exposed to nicotine and what role the hippocampus plays in the onset of nicotine addiction in adolescents.	
Abstract	
Methods/Materials Computer, MCID Autoradiography Software, Special Lens for Radioactive Detection, Pre-prepared Brain tissue slides, Rat Brain Atlas	
I used a Sprague Dawley Rat model for my experiment. Adolescent and Adult rats were treated with nicotine and saline (control) in acute and chronic levels. A total of about 40 rats were used. Then, in-situ hybridization using a radioactive probe was administered to prepare the slides for analysis. Subsequently, Autoradiography Analysis was done with MCID Software. I took readings of neuronal activation (c-fos expression) in dpm/mg in the CA1, CA3 and DG regions of the dorsal hippocampus.	
Results C-fos expression 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. The higher the dpm/mg reading, the more activation in the brain tissue there is. 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. Comparatively, the readings in the adults exposed to chronic nicotine were measured to be 1720 dpm/mg in the CA1, 1695 dpm/mg in the CA3, and 1640 dpm/mg in the DG. The higher amount of c-fos expression in the adolescents shows a greater neural response from an adolescent brain to nicotine than the adult brain. Similar results were observed when studying rats treated with acute levels of nicotine.	
Conclusions/Discussion Higher levels of c-fos expression were seen in adolescents after both acute and chronic treatments of nicotine. The higher levels of neuronal activity in response to nicotine in the hippocampus of adolescents indicate the possibility that hippocampus dependent learning in adolescents does in fact have a significant impact on nicotine addiction. The higher amount of activation also shows that there might be a stronger association being established between smoking and contextual stimuli in adolescents than in adults.	
Summary Statement I looked at the differences in levels of neuronal activation in the hippocampus in response to nicotine and analyzed the role of the hippocampus during the onset of nicotine addiction in adolescents.	
Help Received Used facilities at the Tobacco Transdisciplinary Use Research Center at UC Irvine under Dr. Frances Leslie. UCI Grad Student Jasmin Dao mentored me about autoradiography and lab research.	