A Novel Approach to Substance Abuse Rehabilitation Using Transient Receptor Potential Channels and Insulin Signaling in C. elegans

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Tobacco abuse alone currently accounts for 1 in 5 deaths annually in the US. Despite this, present methods of rehabilitation have proven ineffective with over a 90% likelihood of relapse. To reform this process, C. elegans are a practical model to monitor drug-induced behavior and identify targets for medication development. Their neural homology to humans, and dopamine and cholinergic system–dependent attraction make them highly effective. This experiment challenged C. elegans with various doses of nicotine resulting in unique responses for concentration levels ranging from 100 μM to 1000 μM nicotine. Mutants were used in comparison to wild-type C. elegans to comparatively analyze neural and behavioral differences. Adaptation from pre-exposure lead to olfactory preference alterations based on the concentration of Benzaldehyde. High concentrations that were formerly attractive displayed aversion. Thermo-sensory and chemosensory cues resulted in associative learning properties surprisingly similar to humans. Data indicated clear locomotive and behavioral trends in terms of nicotine response in the absence of the targeted IIS and TRP channel systems. The experiment showed that insulin signaling systems plays a vital role in the observed motivated behaviors. In addition, transient receptor potential (TRP) channels are necessary for an organism to locate biologically relevant stimuli. In this experiment, I have explored the role for the insulin signaling system in the locomotor response of elegans to an acute nicotine challenge as well as a role for TRP channels in mediating nicotine-approach behavior. The combination of these two lines of research promise a superiorly effective rehabilitation and medication research.

Awards Won:
Fourth Award of $500
National Institute on Drug Abuse, National Institutes of Health &amp the Friends of NIDA: Honorable Mention