

## James & Esther King Biomedical Research Program

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*2006 Program  
New Investigator (3-year project)*

**Project Title:** Acute and Long-Term Behavioral and Neurological Effects of Nicotine in the Zebra Finch

**Project Summary:** In 2001, the Centers for Disease Control and Prevention (CDC) reported that there were approximately 46 million smokers in the United States; 4.1 million were adolescents, which represent 18% of all teenagers, generating a major health risk for this age group. A great deal of research has focused on the social factors influencing smoking during adolescence, but almost no research has examined the underlying mechanisms of nicotine use during this developmental phase. This is not surprising, since researchers are not going to ask adolescents to start smoking in order to examine the behavioral and neurobiological effects of nicotine. Although researchers have started to show some interest in studying the effects of psychoactive drugs such as alcohol and nicotine in adolescent animals, it is clear that a large gap in the understanding of the behavioral and neurobiological effects of nicotine on its most rapidly growing group of users is still present.

In this grant, the behavioral and biochemical effects of nicotine in the zebra finch will be studied. Several National Institutes of Health recognize the zebra finch as an important non-mammalian model for neural development. Juvenile and adult animals will be subjected to single and repetitive treatments of nicotine. In Aim 1, the acute and long-term effects of nicotine on natural behavior (song production, locomotor activity, food and water intake) will be studied. In addition, plasma levels of nicotine and cotinine will be measured and corticosterone (stress hormone) levels will be measured in fecal samples. Brain imaging studies will be performed before and after nicotine administration to study potential neuronal damage (in vivo study). After this behavioral study is completed, brain tissue will be used to study potential neuronal damage in vitro (Aim 2) and to study potential changes in protein expression (Aim 3). Quantitative and qualitative changes in the composition of proteins might be useful to understand the molecular mechanisms that lead to and maintain nicotine addiction/dependence.

These data will lay the foundation for further research, focusing on drug therapy for diseases induced by nicotine use either during adolescence and/or during adulthood.