New research identifies gene important for nicotine's effects on the brain

December 5 2006

New research identifies an important gene that influences several aspects of nicotine-induced behaviors in the brain. The study, funded by National Institutes of Drug Abuse, was presented today at the American College of Neuropsychopharmacology's Annual Meeting.

Investigator Marina Picciotto, PhD, associate professor of psychiatry and her colleagues at Yale University, found that nicotine can increase activity of a molecule called CREB in a brain area called the nucleus accumbens.

CREB is able to change the properties of nerve cells, which is important for the rewarding properties of nicotine. Their new study shows that using a genetically altered virus that blocks CREB activity in the nucleus accumbens blocks nicotine reward. "We and other researchers have begun to make very strong links between individual molecules in the brain and nicotine-related behaviors," said Picciotto. "By identifying molecules and changing their activity we can understand how overall behavior is changed. "

Picciotto's work explored how the brain changes when it receives nicotine and, therefore, focused on the dopamine system in the brain. Dopamine is one of a number of neurotransmitters that plays an important role in motivation and reward processes. Nicotine activates the dopamine system in the brain as do other drugs of abuse including cocaine and amphetamines.

"Our work and that of others has shown that nicotine changes signaling in nerve cells in the dopamine system resulting in long-lasting effects," said Picciotto. "We believe that these changes in signaling may explain why people who quit smoking can continue to experience cravings many years later or even start smoking again."

Picciotto hopes her findings lead to the development of new targets for smoking cessation therapies. However, it will not be easy to target the signaling molecules manipulated in this study in human smokers. "They are not just in nerve cells involved in addictive behavior; these signaling molecules are important throughout the brain and body", says Picciotto. "The more we understand how nicotine changes the function of nerve cells, the better we will be able to neutralize its effects on behavior".

Picciotto suggests that future research focus on signaling pathways inside nerve cells and understanding which pathways are really important for nicotine addiction as opposed to other types of abuse.

Picciotto's research used both genetically engineered mice with altered nicotine receptors and viruses that could block CREB function. She and her colleagues showed that one type of nicotine receptor was important for both CREB activity and nicotine reward and that blocking CREB in the nucleus accumbens was sufficient to block nicotine reward.

Source: GYMR

Citation: New research identifies gene important for nicotine's effects on the brain (2006, December 5) retrieved 2 May 2024 from https://medicalxpress.com/news/2006-12-gene-important-nicotine-effects-brain.html

This document is subject to copyright. Apart from any fair dealing for the purpose of private

study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.