

New neuroimaging study identifies 'brain signature' for cigarette cravings

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A new brain imaging study by researchers in the Abramson Cancer Center of the University of Pennsylvania shows that cigarette cravings in smokers who are deprived of nicotine are linked with increased activation in specific regions of the brain.

Using a novel method of measuring brain blood flow developed by John Detre, MD, associate professor of Neurology at Penn, this study is the first to show how abstinence from nicotine produces brain activation patterns that relate to urges to smoke. The findings, to be published in the December 19, 2007, issue of *The Journal of Neuroscience*, make an important contribution to understanding smoking urges, a key risk factor for relapse, at the brain level.

According to Caryn Lerman, PhD, Director of the Transdisciplinary Tobacco Use Research Center and senior author of the paper, and colleagues John Detre, MD, and Ze Wang, PhD, cravings are a hallmark of drug dependence, including nicotine dependence. "There have been several brain imaging studies showing how subjects respond to visual, smoking-related cues, such as a picture of a cigarette or of someone smoking," said Lerman. "However, less is known about the neural basis of urges that arise naturally as a result of nicotine deprivation. This study was designed help fill this research gap."

This joint research effort between Penn's Transdisciplinary Tobacco Use Research Center and the Center for Functional Neuroimaging, used MRI arterial spin labeled (ASL) technology. ASL, a non-invasive technique



for the measurement of cerebral blood flow (CBF) in the brain, was used to compare resting CBF across two scanning sessions which varied by length of periods of abstinence from smoking. Fifteen regular smokers were included in the study. Each participant was scanned in a resting state on two separate occasions: participants smoked a cigarette within an hour of the one scan, and abstained from smoking overnight for the other scan.

The findings indicate that abstinence-induced, unprovoked cravings to smoke are associated with increased activation in brain regions important in attention, behavioral control, memory, and reward. "The craving assessments used in our study predict relapse in smoking cessation treatment," said Lerman. "If validated in larger studies, these results may have important clinical implications. For example, perfusion MRI may aid in the identification of smokers at increased risk for relapse who may require more intensive therapy."

Source: University of Pennsylvania

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