Low Dopamine Levels During Withdrawal Promote Relapse to Smoking

Suggests a new study in Biological Psychiatry

Philadelphia, PA, February 8, 2012 – Mark Twain said, “Giving up smoking is the easiest thing in the world. I know because I’ve done it thousands of times.” Many smokers would agree that it’s difficult to stay away from cigarettes. A new study in Biological Psychiatry this month now suggests that low dopamine levels that occur as a result of withdrawal from smoking actually promote the relapse to smoking.

Dopamine is a brain chemical messenger that is critically important in reward and motivation. Some research suggests that one of its central roles is to send a signal to the brain to “seek something enjoyable”. Indeed, dopamine is released during many rewarding experiences, including taking drugs, smoking, having sex, and eating food.

This signal seems to depend on the dopamine that is released in response to environmental cues, called phasic release, as opposed to the tonic seepage of small amounts of dopamine from nerve cells. The tonic release of dopamine is implicated in helping the dopamine system set the level of its reactivity to inputs.

Since dopamine is released by smoking, it makes sense that dopamine levels become abnormal when a smoker chooses to stop smoking. Researchers from Baylor College of Medicine in Texas undertook their study to characterize these changes.

They studied mice that were administered nicotine, the active constituent of cigarettes, for several weeks. The researchers then withheld the nicotine and measured the subsequent alterations in dopamine signaling during the withdrawal period.

They report that withdrawal from nicotine produced a deficit in dopamine in which the basal dopamine concentration and tonic dopamine signals were disproportionately lower than the phasic dopamine signals. Re-exposure to nicotine reversed the hypodopaminergic state.

“This study is an elegant example of yet another way that addiction ‘hijacks’ the reward system. The phasic release of dopamine triggers us to seek things that, in theory, help us to adapt to our environment,” commented Dr. John Krystal, editor of Biological Psychiatry. “However, in addiction the phasic release of dopamine is heightened and it triggers the pursuit of abused substances. This disturbance of dopamine function would, conceivably, make it that much harder to avoid seeking drugs of abuse.”

According to the authors, these findings indicate that medications that could help elevate tonic dopamine levels during withdrawal may be successful treatment strategies for nicotine-dependent individuals attempting to quit smoking. Theoretically, such a treatment could help normalize any fluctuating dopamine levels from the sudden lack of nicotine, and also lessen the dopamine-influenced urges to seek out the nicotine, leading to relapse.


# # #
Notes for editors
Full text of the article is available to credentialed journalists upon request; contact Rhiannon Bugno at +1 214 648 0880 or Biol.Psych@utsouthwestern.edu. Journalists wishing to interview the authors may contact John Dani, Ph.D., at +713 798 3710 or jdani@bcm.edu.

The authors’ affiliations and disclosures of financial and conflicts of interests are available in the article.

John H. Krystal, M.D., is Chairman of the Department of Psychiatry at the Yale University School of Medicine and a research psychiatrist at the VA Connecticut Healthcare System. His disclosures of financial and conflicts of interests are available here.

About Biological Psychiatry
*Biological Psychiatry* is the official journal of the Society of Biological Psychiatry, whose purpose is to promote excellence in scientific research and education in fields that investigate the nature, causes, mechanisms and treatments of disorders of thought, emotion, or behavior. In accord with this mission, this peer-reviewed, rapid-publication, international journal publishes both basic and clinical contributions from all disciplines and research areas relevant to the pathophysiology and treatment of major psychiatric disorders.

The journal publishes novel results of original research which represent an important new lead or significant impact on the field, particularly those addressing genetic and environmental risk factors, neural circuitry and neurochemistry, and important new therapeutic approaches. Reviews and commentaries that focus on topics of current research and interest are also encouraged.

*Biological Psychiatry* is one of the most selective and highly cited journals in the field of psychiatric neuroscience. It is ranked 4th out of 126 Psychiatry titles and 15th out of 237 Neurosciences titles in the Journal Citations Reports® published by Thomson Reuters. The 2010 Impact Factor score for *Biological Psychiatry* is 8.674.

About Elsevier
Elsevier is a world-leading provider of scientific, technical and medical information products and services. The company works in partnership with the global science and health communities to publish more than 2,000 journals, including The Lancet and Cell, and close to 20,000 book titles, including major reference works from Mosby and Saunders. Elsevier’s online solutions include SciVerse ScienceDirect, SciVerse Scopus, Reaxys, MD Consult and Nursing Consult, which enhance the productivity of science and health professionals, and the SciVal suite and MEDai’s Pinpoint Review, which help research and health care institutions deliver better outcomes more cost-effectively.

A global business headquartered in Amsterdam, Elsevier employs 7,000 people worldwide. The company is part of Reed Elsevier Group PLC, a world-leading publisher and information provider, which is jointly owned by Reed Elsevier PLC and Reed Elsevier NV; the combined market capitalization of the two parent companies is approximately £12bn/€13bn. The ticker symbols are REN (Euronext Amsterdam), REL (London Stock Exchange), RUK and ENL (New York Stock Exchange).