

**Public release date: 21-Oct-2008**

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## **ADHD appears to increase level of nicotine dependence in smokers**

### ***Study may help shed light on underlying biological mechanism***

Young people with ADHD are not only at increased risk of starting to smoke cigarettes, they also tend to become more seriously addicted to tobacco and more vulnerable to environmental factors such as having friends or parents who smoke, according to a study from Massachusetts General Hospital researchers. The report in the *Journal of Pediatrics* also found that individuals with more ADHD-related symptoms, even those who don't have the full syndrome, are at greater risk of becoming dependent on nicotine than those with fewer symptoms.

"Knowing that ADHD increases the risk of more serious nicotine addiction stresses the importance of prevention efforts aimed at adolescents and their families," says Timothy Wilens, MD, director of the Substance Abuse Program in the MGH Pediatric Psychopharmacology Department, who led the study. "It also gives us clues about how the neurotransmitter systems involved in ADHD and tobacco use may be interacting."

Several studies have shown young people with ADHD are more like to smoke and to start smoking at an earlier age. The current investigation was designed to examine whether ADHD also increases the severity of nicotine dependence. Participants were taken from two long-term studies – one in boys and the other in girls – that analyzed a variety of factors in children and adolescents with ADHD compared with a matched control group. Participants completed a standardized questionnaire evaluating smoking history and levels of tobacco dependence in current smokers. Responses from 80 participants with ADHD and 86 controls, all ranging from age 15 to 25, were available for analysis.

While 69 percent of participants with ADHD had ever smoked and 41 percent were current smokers, only 44 percent of controls had ever smoked, with 17 currently smoking. Smokers with ADHD began using tobacco about a year and a half sooner than did control group members, and moderate or higher levels of nicotine dependence were reported by 21 percent of ADHD participants but less than 1 percent of controls.

The two larger studies in which participants enrolled had included assessments of psychiatric symptoms, including those associated with ADHD. For both participants with ADHD and the controls, the more ADHD-related symptoms such as prominent inattention, distraction, overactivity or impulsivity the smokers had, the more serious their dependence on nicotine. A similar increase in tobacco dependence was associated with living with a smoker or having a parent or friend who smoked in ADHD participants but not in controls, implying that the vulnerability to smoking bestowed by ADHD was amplified by environmental factors, Wilens explains.

The study's findings also suggests biological mechanisms that may underlie both ADHD and nicotine dependence. "We've already shown that nicotine-based medications can treat ADHD symptoms, and it's known that the children of mothers who smoked during pregnancy are at greater risk of ADHD," Wilens says. "It looks like interplay between the dopamine system, more substantially related to ADHD and addiction, and the cholinergic system related to smoking is probably important. Further investigations of the neurobiological aspects and potential issues of self-medication should help us better understand what is going on." Wilens is an associate professor of Psychiatry at Harvard Medical School.

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Co-authors of the *Journal of Pediatrics* article are Michael Vitulano, Joel Adamson, Robert Sawtelle, Linsey Utzinger and Joseph Biederman, MD, of the MGH Pediatric Psychopharmacology Program; and Himanshu Upadhyaya, MD, Medical University of South Carolina. The study was supported in part by the National Institute on Drug Abuse.

Wilens has received grant support for other studies from Abbott, Lilly, McNeil, Merck, National Institutes of Health (National Institute on Drug Abuse) and Shire; he is a speaker for McNeil, Novartis and Shire; and serves as a consultant for Abbott, McNeil, Eli Lilly and Company, Merck, NIDA, Novartis, and Shire.

Massachusetts General Hospital ([www.massgeneral.org](http://www.massgeneral.org)), established in 1811, is the original and largest teaching hospital of Harvard Medical School. The MGH conducts the largest hospital-based research program in the United States, with an annual research budget of more than \$500 million and major research centers in AIDS, cardiovascular research, cancer, computational and integrative biology, cutaneous biology, human genetics, medical imaging, neurodegenerative disorders, regenerative medicine, systems biology, transplantation biology and photomedicine.

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