

# WHERE THERE'S SMOKE,

by Scott Kollins, PhD, MS

**MORE THAN 440,000 DEATHS ARE ATTRIBUTED TO CIGARETTE SMOKING ANNUALLY,** making it the single most preventable cause of death and illness in the United States. More than one in five Americans above the age of eighteen smoke cigarettes, and in spite of the well-known health risks associated with smoking, only a small minority of regular smokers achieves prolonged abstinence.

These numbers take a turn for the worse in people who have ADHD, who are at increased risk for cigarette smoking compared to those who do not have the disorder. What do we know about the relationship between ADHD and smoking? What are the evidence-based recommendations for clinical management of smoking in the context of ADHD? What important areas are in need of additional research? Here is what the science tells us.

## **The association between ADHD and smoking** **People with ADHD smoke at rates significantly higher than the general population.**

Data from a number of longitudinal studies have shown clearly that individuals with ADHD are at increased risk for cigarette smoking compared to their peers who do not have ADHD. For example, one early longitudinal study examined individuals initially identified as hyperactive (the term most consistent with a diagnosis of ADHD when the study was initiated in 1974) and matched control comparison children. By the age of seventeen, 46 percent of the individuals initially diagnosed as hyperactive reported daily cigarette smoking, compared to 24 percent of their age-mate controls. By adulthood, 35 percent of the hyperactive group continued to report daily cigarette smoking, compared to just 16 percent of the control participants.

These data are consistent with a more recent study that examined 142 adolescents diagnosed with ADHD and 100 matched control comparison adolescents who did not have ADHD. All the participants were between the ages of thirteen to eighteen years. More than 30 percent of the group with ADHD reported daily cigarette smoking compared to just over 12 percent of the individuals in the control group. Another study focused on adults with ADHD reported that both males and females with ADHD reported higher rates of cigarette smoking as compared to national data for the general



population. Importantly, ADHD is an independent risk factor for smoking, even when other coexisting conditions like conduct disorder and oppositional defiant disorder are controlled.

**Individuals with ADHD start smoking at an earlier age compared to the general population.** The risk for regular cigarette smoking among adolescents and adults with ADHD is exacerbated by the fact that affected individuals typically start smoking at earlier ages. For example, among thirteen- to eighteen-year-olds with ADHD, the mean age of smoking the first cigarette was 13.9 years, compared to 15.3 years for non-ADHD comparison adolescents. Similarly, the mean age of regular smoking among the same individuals was 16.3 years, compared to 17.4 years for the comparison group.

Another longitudinal study of children with and without ADHD similarly reported that among those individuals reporting smoking in early adulthood, 71 percent of the individuals with ADHD began smoking prior to age 17, compared to 27 percent of the control participants who did not have ADHD. So, not only are individuals with ADHD more likely to become regular smokers at some point in their lives, but they start earlier, thus resulting in greater overall exposure to smoking, which significantly affects health outcomes.

**Individuals with ADHD who try smoking report greater likelihood of progression to regular smoking and higher levels of nicotine dependence.** Not everyone who experiments with cigarette smoking progresses to regular smoking. However, the presence of ADHD increases both the overall likelihood of this progression and the speed with which it will occur. Smokers with ADHD also report higher levels of nicotine dependence, an index of how addicted these individuals are to smoking.

One study reported that more than twice as many individuals with a childhood diagnosis of ADHD who were regular smokers reported lifetime nicotine dependence compared to a comparison group. Similarly, in a study of 80 people with ADHD and 86 comparison individuals who did not have ADHD—all of whom reported smoking at some time in their lives—scores on a standardized measure of nicotine dependence were significantly higher among those with ADHD.



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# THERE'S... ADHD

## What the science says

### CHADD's Concerns about Smoking and ADHD

CHADD's board of directors has made smoking a top priority. We want every member to know several key facts:

- › Tweens and teens with ADHD are more likely to smoke and smoke at an earlier age.
- › Smokers with ADHD have a far more difficult time quitting than smokers without ADHD.
- › Pregnant mothers who smoke are far more likely to have children with ADHD.
- › The percentage of people with ADHD who are smokers are twice as likely to be smokers than people without ADHD.

To address this major health hazard for our members, CHADD is planning several initiatives:

- › Advocate for better research funding to address, prevent, and treat smoking in the population affected by ADHD.
- › Seek funding for a consensus conference on smoking and ADHD.
- › Seek funding for a campaign to prevent smoking among tweens and teens with ADHD.



#### FOR MORE INFO

References for this article are provided in the digital edition posted on [www.chadd.org](http://www.chadd.org).

**People with ADHD who smoke have a harder time quitting.** Although smoking cessation rates for the general population are notoriously low, there is some evidence that individuals with ADHD who smoke fare even worse when they try to quit. Given the higher rates and greater severity of nicotine dependence described above, this is not surprising.

One study examined quit ratios as an indicator of smoking cessation success, defined as the percentage of individuals who reported ever having smoked who defined themselves currently as ex-smokers. Nearly twice as many individuals without ADHD who had a lifetime history of smoking reported being an ex-smoker currently compared to the group with ADHD (48.5 percent versus 29 percent, respectively). Very few studies have systematically examined smoking cessation outcomes among those with ADHD. Some of these findings will be described in more detail below.

### **Possible causes of the association**

**ADHD and cigarette smoking may have common genetic origins.** Molecular genetic studies have identified similar candidate genes associated with both ADHD and smoking, suggesting common neurobiological mechanisms may give rise to this comorbidity.

One review identified seven genes that are consistently and significantly associated with ADHD:

- › the dopamine D4 and D5 receptor genes (DRD4, DRD5)
- › the dopamine transporter gene (DAT1)
- › the dopamine beta hydroxylase gene (DBH)
- › the serotonin HTR1B gene
- › the serotonin transporter gene (5-HTT)
- › the synaptosomal-association protein 25 gene (SNAP-25)

Of these seven genes consistently shown to have association with ADHD, six have also been shown to be associated with aspects of smoking behavior. Variants of the DRD4, DAT, and DBH genes, as well as the HTR1B and 5-HTT genes have been shown to be associated with higher levels of smoking behavior in a range of populations. In addition, a haplotype of the DRD5 gene has been shown to be protective against smoking phenotypes. A range of other genes associated with smoking outcomes, including the 5HTTLPR and variants of the MAO-A gene, have also been shown to be associated with ADHD-related outcomes, though none have been consistently replicated as a risk factor for the development of ADHD.

**Nicotine delivered via smoking may serve as a form of “self-medication” for people with ADHD.** Nicotine exerts beneficial effects on a range of processes known to be disrupted in individuals with ADHD, including attention, inhibitory control, and working memory. As such, it has often been proposed that those with ADHD are at heightened risk for smoking because of the beneficial effects of nicotine across a range of cognitive processes.

Support for this view comes from studies demonstrating that nicotine administration enhances attention in smoking and non-smoking adults with ADHD to a degree comparable to methylphenidate. Transdermal nicotine alone and in combination with stimulant medication also reduces self-reported ADHD symptoms.

In general, findings are mixed with respect to the so-called “self-medication” hypothesis of the ADHD-smoking comorbidity. There has been considerable inconsistency in the research definition with respect to how the construct of self-medication is defined and measured. More research is needed in this area to understand more about whether nicotine and cigarette smoking serve to reduce the core ADHD symptoms and therefore increase risk for regular smoking.

### **Prevention and treatment**

Very little work has been conducted to understand how to reduce the risk for smoking among individuals with ADHD or how to treat smoking or nicotine dependence in those who already use cigarettes. One prospective study randomly assigned non-smoking youth with ADHD to receive bupropion treatment or placebo. They

were subsequently followed for approximately five years. The participants were also allowed to initiate stimulant treatment as needed during the course of the trial. The results showed that bupropion treatment did not influence the likelihood of cigarette smoking, but that concurrent stimulant treatment was associated with lower risk of initiating smoking and continuing smoking.

To date, only two published studies have been conducted to evaluate smoking cessation interventions in smokers with ADHD. Both of these studies examined nicotine replacement therapy alone and in combination with approved stimulant medication for ADHD (OROS-methylphenidate and lisdexamfetamine). Outcomes for both of these studies were similar—smokers who received stimulant medication plus nicotine replacement therapy fared no better than those who received nicotine replacement therapy alone. In both studies, however, ADHD symptoms were significantly improved in the groups who received the stimulant medication, suggesting that the core symptoms of ADHD can be treated effectively in the context of a smoking cessation attempt.

These findings are important, since several small laboratory studies have been published showing that administration of stimulant drugs increases cigarette smoking in both ADHD and non-ADHD smoking. Also of note, in the larger of the two clinical trials, there was evidence that OROS-methylphenidate did significantly facilitate smoking cessation compared to placebo among non-Caucasian smokers with ADHD.

### Key areas for future research

Given the well-documented association between ADHD and cigarette smoking, the most important areas of future research must help us better understand this link in order to develop more effective prevention and treatment programs. In addition to the genetic and pharmacologi-

cal factors discussed above, other important psychosocial factors, such as familial smoking, peer relations, and academic functioning, have all been shown to contribute to smoking risk in children with ADHD. Future research should capitalize on what we know about these areas to begin to develop creative and targeted prevention programs for youth with ADHD. Basic science, such as molecular genetic and neuroimaging research, can also contribute to the development of novel interventions.

### Reducing the risk for smoking

In the absence of controlled studies, there are no specific interventions that can be recommended to reduce the risk of smoking in kids with ADHD. Some general recommendations may still help reduce risk, however.

Kids are more likely to smoke if their family members or friends do. If you smoke and do not want your child to smoke, quit now. Similarly, parents should be aware of the peer group and activities of their child or adolescent.

For clinicians treating patients with ADHD who are already smokers, it seems that use of stimulant medication does not have a negative impact on cessation for those interested in quitting. More research needs to be done, however, on the effects of stimulant medication in smokers with ADHD who are not interested in quitting.

Nicotine replacement therapy seems to work equally as well for smokers with ADHD as it does for the general population. Overall, clinicians treating smokers with ADHD should monitor smoking levels—if possible via objective or biochemical means—to ensure that treatment for ADHD is not adversely affecting smoking behavior. ●

