

# Health Advisory

## NICOTINE RISKS FOR CHILDREN, TEENS, AND PREGNANT WOMEN

**Updated February 2018**

This advisory seeks to inform health care professionals and parents of the public health risks of nicotine exposure to children, teens, and pregnant women.

With increased use and expanding availability of nicotine products such as e-cigarettes, especially among youth, it is important to understand the facts about nicotine and its health effects. Nicotine is addictive and can be toxic at high doses. Evidence also supports that it can harm brain development during adolescence. Nicotine exposure is unsafe for youth.

### **Nicotine products pose a serious health risk for youth.**

The use of e-cigarettes and other Electronic Nicotine Delivery Systems (ENDS; e.g. vape pens, hookah pens, and e-pipes) recently surpassed conventional cigarettes to become the most commonly used tobacco product among U.S. youth.<sup>[1]</sup> Given the use of e-cigarettes among teens increased dramatically during 2011-2015,<sup>[1]</sup> it is critical that public health officials and the general public understand the potential risks of using nicotine products for youth. Recent evidence suggests that, compared to youth who have never used them, youth who have tried e-cigarettes are twice as likely to start smoking in the future.<sup>[2]</sup> This relationship appears to be stronger for lower-risk adolescents, suggesting e-cigarettes may attract youth who otherwise would not have smoked.<sup>[3]</sup> Human clinical studies report similar findings—adolescent nicotine exposure leads to higher rates of smoking behavior in adulthood.<sup>[4-9]</sup> Accordingly, youth should avoid use of all nicotine containing products, including e-cigarettes.

### **Nicotine exposure can harm brain development during adolescence.**

Adolescence (the transitional period between childhood and adulthood, typically ranging from 12-18 years of age) is a critical window for brain growth and development, when it is still “under construction.”<sup>[10, 11]</sup> As a consequence, adolescents are especially at risk of harm caused by nicotine exposure.

Evidence indicates that exposure to nicotine during adolescence can have long-term effects on brain development,<sup>[1, 12-14]</sup> and may increase the risk of addiction to other substances by causing changes within the brain.<sup>[13, 15-28]</sup> Animal research has found that even in small doses, nicotine exposure in adolescence causes long-lasting changes in brain development. This could have negative implications for learning, memory, attention, behavioral problems, and future addiction in human adolescents.<sup>[14, 26, 29-33]</sup>

### **Nicotine is highly addictive.**

Nicotine is the drug in tobacco that causes addiction.<sup>[34-38]</sup> Studies show that symptoms of nicotine addiction can appear among youth within only a few days or weeks after smoking initiation.<sup>[39, 40]</sup> Nicotine stimulates reward pathways in the brain, and can be as addictive as heroin or cocaine.<sup>[18, 35, 41-47]</sup> Because their brains are still developing, adolescents are especially vulnerable to nicotine addiction.<sup>[10, 13,</sup>

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<sup>48-51]</sup> While experimental studies testing the effects of nicotine addiction on the human adolescent brain do not exist due to ethical restrictions, researchers agree that results from animal studies do translate to humans<sup>[1]</sup>. Existing animal studies show that adolescents are more sensitive to the rewarding effects of nicotine at lower doses than adults, and experience fewer negative side effects of higher-dose exposure.<sup>[52, 53]</sup> Further, adolescents are less sensitive to the negative effects of withdrawal than adults, making them more susceptible to nicotine addiction. Human clinical reports confirm this pattern, showing adolescents are more likely to experience nicotine dependence at lower doses than adults.<sup>[4-9]</sup>

### Nicotine is harmful to the health of unborn children.

The U.S. Surgeon General has concluded that use of products containing nicotine poses danger to pregnant women and unborn children.<sup>[1, 16]</sup> Fetal exposure to nicotine can have a variety of negative long-term consequences including sudden infant death syndrome, impaired brain and lung development, auditory processing problems, effects on behaviors and obesity, and deficits in attention and cognition.<sup>[11-13, 16, 22-24, 54, 55]</sup> Studies also indicate that fetal nicotine exposure is associated with nicotine dependence in adolescence.<sup>[11, 16, 56-65]</sup> Pregnant women and women who intend to become pregnant should avoid e-cigarettes to minimize unnecessary exposure to nicotine.<sup>[1, 16]</sup>

### Nicotine causes harmful physical effects and can be toxic in high doses.

Nicotine affects the cardiovascular and central nervous systems, causing blood vessels to constrict, raising the pulse and blood pressure.<sup>[34, 66]</sup> Eating, drinking, or otherwise absorbing nicotine at high enough doses can lead to nicotine poisoning, especially in children.<sup>[16]</sup> Symptoms of poisoning include nausea, vomiting, seizures and respiratory depression.<sup>[67, 68]</sup> In high enough doses, nicotine can be fatal.<sup>[69]</sup>

There has been a significant rise in the number of calls to poison control centers for exposures to liquids used in e-cigarettes.<sup>[70]</sup> Nationally, the number of calls rose from one per month in September 2010 to 215 per month in February 2014, with over half (51.5%) occurring among children aged 0-5 years.<sup>[71]</sup> Similarly, calls increased in Minnesota, with e-cigarette-related poisonings among children 0-5 years increasing from just 1 in 2011 to 62 in 2014. Many cases involve children and toddlers who ingested e-cigarette liquids left unattended.

The amount of nicotine in products may vary widely. Nicotine levels in e-cigarettes have been found to range from 0 to 34 mg/mL,<sup>[72]</sup> and studies have found discrepancies between the labeled and measured nicotine content in some e-cigarette products.<sup>[73]</sup> Because of the lack of quality and manufacturing standards for e-cigarettes and other ENDS, it is difficult for the consumer to know how much nicotine is contained in these products, increasing the risk of a toxic exposure. The U.S. Food and Drug Administration now has the authority to address the varying nicotine levels in tobacco products, including e-cigarettes, but has not yet done so.

## Recommendations for Parents of Young Children

### Keep nicotine-containing products out-of-reach

- Nicotine-containing cartridges and bottles are a potential source of poisoning through ingestion, skin or eye contact. Store these materials out of the reach of young children.
- For products kept in the home, ensure that they are kept in child-resistant packaging, which is required for all liquid nicotine sold in Minnesota and nationwide.<sup>[74]</sup>
- Call 1-800-222-1222 for poison emergencies.

## Recommendations for Health Care Professionals

### Educate and Advise

- Advise that **nicotine exposure is unsafe** for children, teens, and pregnant women.
  - The nicotine contained in products such as e-cigarettes is highly addictive.
  - Accidental exposure to liquids contained in e-cigarettes and similar products can result in nicotine poisoning at high enough doses, especially in children.
- Advise that exposure to nicotine can harm the developing adolescent brain.
- Advise pregnant women to avoid using nicotine products.

*Adults interested in quitting tobacco can receive free resources, including nicotine replacement therapies like patches or gum, from QUITPLAN® Services at [www.quitplan.com](http://www.quitplan.com) or by calling 1-888-354-7526.*

### Protect Children from Nicotine Poisoning

- Inform parents and nicotine users that nicotine-containing cartridges and bottles are a potential source of poisoning through ingestion, skin, or eye contact. Store these materials out of the reach of children, and call the Minnesota Poison Control System at 1-800-222-1222 for expert help in case of accidental exposure.

Minnesota Department of Health  
Tobacco Prevention and Control  
651-201-3535  
[tobacco@state.mn.us](mailto:tobacco@state.mn.us)  
[www.health.state.mn.us/nicotine](http://www.health.state.mn.us/nicotine)

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*To obtain this information in a different format, call: 651-201-3535. Printed on recycled paper.*

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