E-Cigarette Health Advisory

Nicotine risks for children, teens, young adults and pregnant women

This advisory seeks to inform health care professionals and parents of the health risks of nicotine exposure to children, teens and pregnant women related to the use of e-cigarettes (vaping devices).

With increased use and expanding availability of nicotine products such as e-cigarettes, especially among young people, it is important to understand the facts about nicotine and its health effects. Studies have shown that nearly all e-cigarettes sold contain nicotine. Nicotine is addictive and can be toxic at high doses. Evidence also has shown nicotine can harm brain development during adolescence and young adulthood. Nicotine exposure, whether through traditional or new and emerging products, is unsafe for young people.

Nicotine products pose a serious health risk for youth.

The use of e-cigarettes and other e-cigarette or vaping products (such as vape pens, hookah pens, e-cigars and e-pipes) recently surpassed the use of conventional cigarettes to become the most commonly used tobacco product among U.S. youth.[1] Given the use of e-cigarettes among teens increased dramatically during 2011-2015,[1] it is critical that public health officials and citizens understand the potential risks of using nicotine products for young people.

A growing body of evidence from multiple countries shows that young people who have never smoked cigarettes — but currently use e-cigarettes — are more likely to smoke cigarettes in the future than are young people who do not use e-cigarettes.[8-13, 83-84] Human clinical studies report similar findings — adolescent nicotine exposure leads to higher rates of smoking behavior in adulthood.[8-13] Accordingly, young people should avoid use of all nicotine-containing products, including e-cigarettes.

Nicotine exposure can harm brain development.

Adolescence — the transitional period between childhood and adulthood, typically ranging from ages 12 to 18 — is a critical window for brain growth and development, when it is still "under construction."[14, 15] However, the brain continues to undergo structural and functional development into young adulthood, to age 25.[1, 78, 79] Consequently, young people are especially at risk of harm caused by nicotine exposure.

The brain undergoes significant neurobiological development during adolescence and young adulthood, which are critical periods of sensitivity to neurobiological insults, including nicotine.[79-82]

Evidence indicates that exposure to nicotine during adolescence can have long-term effects on brain development,[1, 16-18] and may increase the risk of addiction to other substances by causing changes

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within the brain.[17, 19-32] 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 young people.[18, 30, 33-37]

■ Nicotine causes harmful physical effects and can be toxic.

Nicotine affects the cardiovascular and central nervous systems, causing blood vessels to constrict, raising the pulse and blood pressure.[38, 68] Eating, drinking or absorbing nicotine can lead to nicotine poisoning; children are especially vulnerable.[20] Symptoms of nicotine poisoning include nausea, vomiting, seizures and respiratory depression.[69, 70] Nicotine poisoning can be fatal.[71]

There has been a significant rise in the number of calls to poison control centers for exposures to liquids used in e-cigarettes.[72] Nationally, the number of calls rose from one per month in September 2010 to 215 per month in February 2014, with nearly 52 percent occurring among children under age 5.[73]

Similarly, calls increased in North Carolina with poisonings related to e-cigarettes increasing from just eight in 2011 to 121 in 2016. Many of these cases were about ingestion of e-cigarette liquids that were left out in reach of toddlers and children.

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,[75] and studies have found discrepancies between the labeled and measured nicotine content in some e-cigarette products.[76] Because of the lack of quality and manufacturing standards for e-cigarettes and other electronic nicotine delivery systems (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.

■ Nicotine is highly addictive.

Nicotine is the drug in tobacco that causes addiction.[38-42] Nicotine stimulates reward pathways in the brain, and can be as addictive as heroin or cocaine.[22, 39, 43-49] Because their brains are still developing, adolescents and young adults are especially vulnerable to nicotine addiction.[14, 17, 50-53]

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.[1] 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.[54, 55]

Further, young people 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.[8-13]

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.[1, 20]

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.[15-17, 20, 26-28, 56, 57] Studies also indicate that fetal nicotine exposure is associated with nicotine dependence in adolescence.[15, 20, 58-67]

Pregnant women and women who intend to become pregnant should avoid e-cigarettes to minimize unnecessary exposure to nicotine.[1, 20]

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 if it's in 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.
- People of all ages interested in quitting tobacco can receive free coaching, and may qualify for free nicotine replacement medication from QuitlineNC at www.quitlinenc.com or by calling 1-800-QUIT-NOW (1-800-784-8669).

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 Carolinas Poison Center at 1-800-222-1222 for expert help in case of accidental exposure.

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.
- Makes sure that products kept in the home are kept in child-resistant packaging, which is required for all liquid nicotine sold in North Carolina and nationwide. [77]
- Call 1-800-222-1222 for poison emergencies.

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