



Health Advisory: Nicotine Risks for Children and Adolescents

June 10, 2015

This advisory seeks to inform health care professionals and parents of the public health risks of nicotine exposure.

With the increase in use of alternative nicotine-containing 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. Evidence also supports that it may harm brain development during adolescence. No amount of nicotine exposure is safe for youth.

Nicotine is highly addictive.

Nicotine is the drug in tobacco that causes addiction.^[1-5] Nicotine stimulates reward pathways in the brain, and can be as addictive as heroin or cocaine.^[2, 6-13] Because their brains are still developing, adolescents are especially vulnerable to nicotine addiction.^[14-19] 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.^[20, 21] Further, they are less sensitive to the negative effects of withdrawal than adults, making them more susceptible to nicotine addiction as adolescents. Human clinical reports confirm this pattern, showing adolescents more likely to experience nicotine dependence at lower doses than adults, and that adolescent nicotine exposure leads to higher rates of smoking behavior in adulthood.^[22-27] There is no safe amount of nicotine exposure for youth.

Nicotine may 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.”^[14, 28] As a consequence, adolescents are especially at risk to the harms caused by nicotine exposure.

Evidence suggests that exposure to nicotine during adolescence may have long-term effects on brain development.^[29] Evidence also suggests that nicotine may increase the risk of addiction to other substances by causing changes within the brain.^[12, 19, 30-40] 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 in human adolescents for learning, memory, attention, behavioral problems, and future addiction.^[40-45]

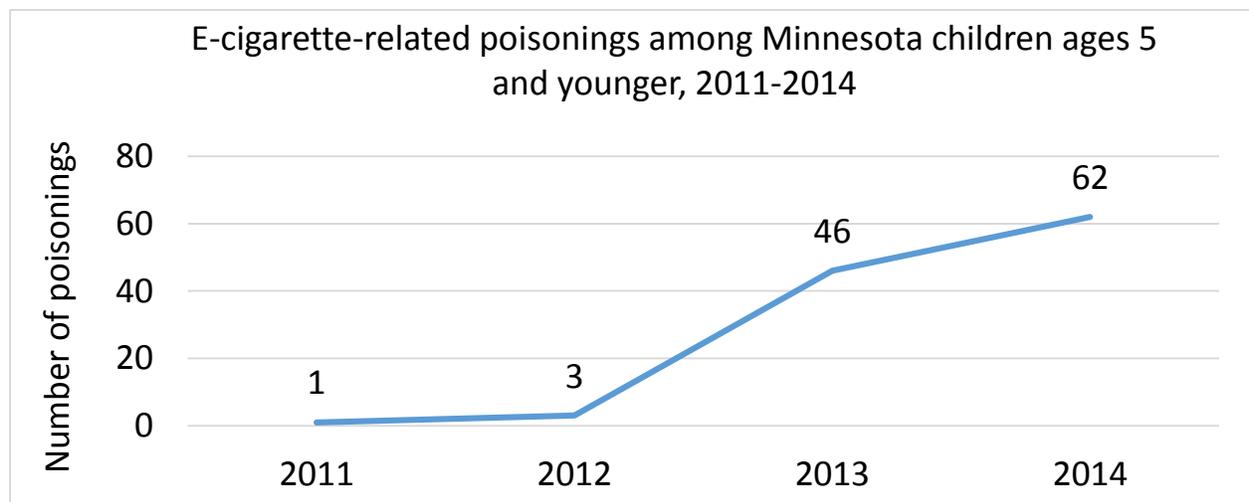
Nicotine is harmful to fetal health during pregnancy.

Evidence shows that fetal exposure to nicotine can have negative long-term effects, including impaired fetal brain and lung development.^[19, 28, 29, 31, 36-38, 46] Studies also indicate that nicotine exposure during pregnancy impairs fetal lung development.^[28, 31, 47-55]

Nicotine causes harmful physical effects, and can be toxic at any age.

Nicotine affects the cardiovascular and central nervous systems, causing blood vessels to constrict, raising the pulse and blood pressure.^[1, 56] Eating, drinking, or otherwise absorbing nicotine can lead to nicotine poisoning, especially in children.^[31] Symptoms of poisoning include nausea, vomiting, seizures and respiratory depression.^[57, 58] In high enough doses nicotine can be fatal.

There has been a significant rise in the number of calls to poison control centers for both adults and children who were exposed to liquids used in e-cigarettes.^[59] 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.^[60] Similarly, drastic increases are also seen 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.

Products like e-cigarettes, e-hookahs and vape pens containing nicotine, are currently unregulated. Nicotine levels in e-cigarettes can range from 0 to 34 mg/mL,^[63] and studies have found discrepancies between the labeled and measured nicotine content in some e-cigarette products.^[64] Because of the lack of quality and manufacturing standards for e-cigarettes and other electronic nicotine delivery systems, it is difficult for the consumer to know how much nicotine is contained in these products, increasing the risk of a toxic exposure.

Recommendations for Parents

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 children.
- For products kept in the home, ensure that it is kept in child resistant packaging, which is required for all liquid nicotine sold in Minnesota after January 1, 2015.

Call 1-800-222-1222 for poison emergencies.

Recommendations for Health Care Professionals

Educate and Advise Parents

- Advise that there is **no safe level of nicotine** exposure for pregnant women, infants, children or adolescents.
 - 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, especially in children.
- Advise that use of products containing nicotine, including e-cigarettes and other electronic nicotine delivery systems, may be harmful to adolescent brain development.

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.

- Advise parents that if they keep products containing nicotine in the home, they should ensure that it is kept in child resistant packaging, something required for all liquid nicotine sold in Minnesota after January 1, 2015.

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