

A New Source of Nicotine Poisoning: E-Cigarettes and E-Liquid Nicotine

Electronic cigarettes (e-cigarettes) are becoming very popular as a replacement for traditional tobacco products. But with the increase in use there has been an increase in poisonings. According to the CDC, calls to poison centers involving children and adults increased from 1 a month in September 2010 to 215 per month in February 2014 (*CDC. MMWR 2014;63:291-2*).

E-cigarettes contain nicotine in a cartridge that is vaporized by a heating coil. When full, the cartridges contain a volume of ≥ 1 mL of liquid nicotine. Poisonings can involve the cartridge itself or the e-liquid from refill bottles. Many of the e-liquid nicotine products are flavored (e.g. bubble gum, chocolate) making them attractive to toddlers and teens, and they are often sold in containers without child-resistant caps. The bottles are usually small (5 mL to 30 mL), but large containers that hold liters or gallons are also available. The liquid is sold in varying concentrations; most of the ready-to-use products contain up to 24 mg of nicotine per mL while some products contain up to 100 mg/mL designed to be diluted before using. The products are currently not regulated; therefore the actual amount of nicotine might not be as labeled, and other toxic ingredients could be present. As little as 1 mg nicotine can cause symptoms in a child, and the lethal dose in a child or adult is estimated to be ≥ 1 mg/kg. Because e-liquid nicotine is highly concentrated, severe toxicity and death is possible with very small volumes, as little as a fraction of a milliliter or a few drops.

Nicotine binds to and stimulates nicotinic acetylcholine receptors producing primarily sympathetic nervous stimulation. With high doses, parasympathetic stimulation producing the cholinergic toxidrome occurs, as well as neuromuscular blockade. Signs and symptoms of nicotine toxicity include nausea, vomiting, diarrhea, salivation, sweating, weakness, hypertension and tachycardia followed by hypotension, bradycardia, arrhythmias, lethargy, confusion, tremors, seizures, coma, and respiratory muscle paralysis leading to death.

A child who ingests any amount of e-liquid nicotine should be evaluated in an emergency department. Supportive measures to assist ventilation and to treat seizures and cardiovascular effects should be provided. Activated charcoal in theory might be useful if the ingestion is recent, but vomiting will limit its usefulness. Atropine is indicated for bradycardia or excessive oral and bronchial secretions. Qualitative screening and quantitative measurement of nicotine and its metabolite, cotinine, are not readily available in the hospital setting and are not useful in guiding management of acute ingestions.

Lisa Booze, PharmD, CSPI



Did you know?

The FDA proposed a rule on April 24, 2014 that would give the agency the authority to regulate e-cigarettes.

Currently, the FDA regulates most tobacco products, over-the-counter nicotine replacement products, and electronic cigarettes that are specifically marketed for therapeutic purposes. The FDA has no authority over most e-cigarettes and other products such as cigars, pipe tobacco, nicotine gels, dissolvable nicotine and waterpipe tobacco. The new rule will require manufacturers to register with the FDA and report product ingredients, market new products only after FDA review, only make claims based on scientific evidence, and require age restrictions and health warnings. The proposed rule will be available for comment for 75 days. For more information or to comment on the rule, go to www.fda.gov/TobaccoProducts/Labeling/ucm388395.htm.