

# Electronic Nicotine Delivery Systems

## ***What ARE These Things?!***

Electronic Nicotine Delivery Systems (ENDS), also called e-cigarettes, personal vaporizers, vape pens, e-cigars, e-hookah, or vaping devices, are products that produce an aerosolized mixture containing flavored liquids and nicotine that is inhaled by the user. ENDS can resemble tobacco products like cigarettes, cigars, pipes, or common gadgets like flashlights, flash drives, or pens.

ENDS are battery-powered; some can be recharged via a USB port, others are disposable. ENDS contain a vaporizer, which is the piece that heats the liquid. Disposable ENDS do not require charging, changing batteries or liquid, last roughly as long as two packs of cigarettes, and are typically around \$10. Rechargeable ENDS 'starter kits' are usually around \$35, typically last as long as a pack and a half of cigarettes before needing to be recharged, and use either a cartridge or tank to store the flavored liquid. These estimates vary by brand and by individual use patterns. In both types of ENDS, vapor is exhaled from the end, mimicking the behavior of a regular cigarette. The nicotine concentration in ENDS solution can range from 0 mg/mL to as high as 36mg/mL<sup>1</sup>.

Some ENDS solutions do not contain any nicotine, and are used to do tricks like blowing smoke rings, but most ENDS solutions contain nicotine in addition to chemicals present in all ENDS solutions, such as anti-freeze, diethylene glycol, and carcinogens like nitrosamines<sup>1</sup>. ENDS have also been used to vape marijuana, herbs, waxes, and oils. These products have been touted as a "safer" alternative to smoking, a way to quit smoking cigarettes, and a way to smoke in places cigarette smoking is not allowed. However, these products are not yet regulated nor approved for smoking cessation by the US Food and Drug Administration (FDA), and the long-term health effects to users and bystanders are still unknown<sup>1</sup>.

## ***Types of ENDS***

### **Rechargeable e-cigarette**



Image courtesy of  
Truth Initiative

### **Disposable e-cigarette**



## ENDS devices compared to combustible tobacco products



L to R: vape pen, combustible cigarette, three different types of e-cigarettes, e-hookah, e-cigarette, combustible cigar, ENDS, two different types of vape pens

### ***Lack of Regulation***

Because the marketing and product requirements of ENDS are not currently regulated, there are no standards for product manufacturing or safety. The amount of nicotine in a cartridge can vary widely between brands because of this lack of regulation<sup>1</sup>. The chemical compounds in an ENDS device can also vary between brands. Until rigorous research is done on these products, their safety is unknown. These concerns have been voiced repeatedly by the health community<sup>2</sup> and by lawmakers<sup>3</sup>.

In 2014, the FDA proposed a new rule to extend its tobacco regulating authority to e-cigarettes. The proposed rule would restrict sales to minors younger than 18, require health warnings on packaging, prohibit vending machine sales, and prohibit marketing the products as healthy or safe. The Academy submitted comments on the proposed new rule, supporting the FDA's intent and requesting that additional provisions to the rule be made<sup>4</sup>, but so far, regulation of e-cigarettes has not happened.

Despite these items not being regulated in a comprehensive manner, many people still use them. Common reasons for use include: the perception that they are healthier/less toxic than combustible cigarettes, aid in tobacco craving/withdrawal symptoms, and assistance in smoking cessation<sup>5</sup>.

### ***Dangerous Appeal to Youth***

ENDS cartridges are available in a variety of youth-friendly flavors. A quick Google search shows availability of flavors like peach schnapps, java jolt, piña colada, peppermint, bubble gum, and chocolate. These flavors have been banned in combustible cigarettes, but exist in ENDS, and it's these flavors that have been shown to entice children<sup>6</sup>. While the majority of states have passed laws prohibiting sales of these devices to minors<sup>7</sup>, Internet access is a major concern. Because these devices are fairly easy to obtain, use of e-cigarettes by youth is on the rise: 2014 Monitoring the Future data shows that, for the first time, more teens used e-cigarettes than regular cigarettes<sup>8</sup>. Thirty day prevalence for e-cigarettes was 9% of 8<sup>th</sup> graders, 16% of 10<sup>th</sup> graders, and 17% of 12<sup>th</sup> graders, compared to 4%, 7%, and 14% 30 day prevalence for combustible cigarette use, respectively<sup>8</sup>.

### **Public Health Concerns**

ENDS aid tobacco companies in circumventing smoke-free laws. While some smoke-free laws do not specify whether ENDS are specifically prohibited, there is an effort to add these devices to smoke-free air laws, mostly on the local level, to prohibit ENDS use in places like correctional facilities, school properties, and commuter trains<sup>9</sup>. However, ENDS continue to be marketed as a way to smoke in places you can't legally smoke. The desire to get around smoke-free laws has led to the creation of vaping lounges- similar to cigar bars and hookah lounges, these vaping lounges allow ENDS users to use their devices (or 'vape') in a confined, social setting. However, studies have shown that secondhand aerosol is not harmless, and exposes bystanders to exhaled chemicals including nicotine<sup>1</sup>.

Sales of ENDS have grown rapidly in the US. ENDS are now estimated to be a \$1.5 billion market, and are projected to grow 24.2% per year through 2018<sup>10</sup>. Also worrisome is that e-cigarette manufacturers are offering incentives to purchase their product. Some companies use reward programs that give discounts and free products to their customers, and some offer recycling programs: participants earn free ENDS by mailing back used products. Coupons are frequently offered for these devices, and are available for purchase on sites like Groupon. Several tobacco companies in the US and abroad have purchased or created their own brands of ENDS devices, including products like e-hookah or e-cigars. These products are available widely, in convenience and retail stores, mall kiosks, tobacco or vape shops, and online.

### **Pediatric Concerns**

Due to a lack of regulation in ENDS marketing, children, who are impressionable and model the behavior of adults, are at risk from viewing marketing aimed at adults. ENDS are marketed through TV, radio, print media like magazines, billboards, Internet, and social media ads<sup>1</sup>- methods by which cigarettes have not been able to advertise since the 1998 Master Settlement Agreement<sup>11</sup>. This is also a concern due to the increased number of ENDS users- these devices mimic conventional cigarette use and help to re-normalize smoking behaviors<sup>1</sup>. Because ENDS are offered in many child-friendly flavors, there is a major risk of toxicity- the ENDS solution poses a poison risk to children through ingestion or absorption through the skin. A child can be poisoned with very small amounts of nicotine- less than half a teaspoon of an ENDS concentrated nicotine solution is enough to be fatal to the average 12kg, 20 month old child<sup>1</sup>. In 2014, poison centers in the US reported 3,783 exposures to e-cigarette devices and nicotine liquid, compared to only 1,543 exposures in 2013<sup>12</sup>. Through September 2015, 2,452 exposures were reported for the year<sup>12</sup>. Some states have enacted legislation to require child-resistant packaging<sup>8</sup>, and a bill to do this at the national level has been introduced and supported by the AAP.

### **AAP Recommendations**

In October 2015, the AAP released a policy statement focused on ENDS<sup>1</sup>. Several recommendations were made to protect children from ENDS use, ENDS aerosol exposure, and liquid nicotine toxicity:

- Pediatricians should screen for ENDS use and provide prevention counseling
- ENDS should not be recommended for smoking cessation
- ENDS users should be offered or referred for tobacco cessation counseling and FDA-approved tobacco dependence pharmacotherapies
- Children should not be exposed to ENDS, ENDS solution, including ENDS aerosol
- Pediatricians should be familiar with symptoms of nicotine poisoning

- Reduce youth access to and demand for ENDS by raising the sales age to 21, prohibiting online sales, prohibiting flavors in ENDS, and restricting advertising or media depictions
- ENDS should be taxed at the same rate as combustible cigarettes
- Funding should be available to protect youth from and study the health effects of ENDS

Pediatricians should be aware of the dangers and concerns, and have informed conversations with patients and families about ENDS. For more information about how to talk to patients and families about ENDS in practice, including screening questions and cessation recommendations, please visit <http://www2.aap.org/richmondcenter/ENDS.html>.

---

## CITATIONS

- 1) American Academy of Pediatrics Section on Tobacco Control. Policy statement: Electronic Nicotine Delivery Systems. *Pediatrics*. 2015; 136(5): 1018–1026.
- 2) AAP Richmond Center. September 19, 2013. Letter to President. Available at <http://www2.aap.org/richmondcenter/pdfs/Sept2013letterECigs.pdf>. Accessed October 16, 2015.
- 3) National Association of Attorneys General. September 24, 2013. Letter to Commissioner Hamburg. Available at <http://www.mass.gov/ago/docs/press/2013/e-cigarette-letter.pdf>. Accessed October 16, 2015.
- 4) AAP Richmond Center. August 4, 2014. AAP Deeming Comments. Available at <http://www2.aap.org/richmondcenter/pdfs/AAPDeemingComments.pdf>. Accessed October 16, 2015.
- 5) Etter J, Bullen C. Electronic Cigarette: User Profile, Utilization, Satisfaction and Perceived Efficacy. *Addiction*. 2011; 106(11): 2017-2028.
- 6) De Graaf C, Zandstra E. Sweetness Intensity and Pleasantness in Children, Adolescents, and Adults. *Physiol Behav*. 1999; 67(4): 513–520.
- 7) National Conference of State Legislatures. Alternative Nicotine Products- Electronic Cigarettes. Available at <http://www.ncsl.org/research/health/alternative-nicotine-products-e-cigarettes.aspx>. Accessed October 16, 2015.
- 8) Johnston, L., et al. (2015). Monitoring the Future national survey results on drug use: 1975-2014: Overview, key findings on adolescent drug use. Ann Arbor: Institute for Social Research, The University of Michigan.
- 9) Americans for Nonsmokers' Rights. January 1, 2015. U.S. State and Local Laws Regulating Use of Electronic Cigarettes. Available at <http://www.no-smoke.org/pdf/ecigslaws.pdf>. Accessed October 16, 2015.
- 10) Fortune. June 10, 2014. U.S. e-cigarette sales seen rising 24.2% per year through 2018. Available at <http://fortune.com/2014/06/10/e-cigarette-sales-rising/>. Accessed October 16, 2015.
- 11) Campaign for Tobacco-Free Kids. July 9, 2003. Summary of the Master Settlement Agreement (MSA). Available at <http://www.tobaccofreekids.org/research/factsheets/pdf/0057.pdf>. Accessed October 16, 2015.
- 12) American Association of Poison Control Centers. September 30, 2015. Electronic Cigarettes and Liquid Nicotine Data. Available at [https://aapcc.s3.amazonaws.com/files/library/E-cig\\_Nicotine\\_Web\\_Data\\_through\\_9.2015\\_IAIV9Wr.pdf](https://aapcc.s3.amazonaws.com/files/library/E-cig_Nicotine_Web_Data_through_9.2015_IAIV9Wr.pdf). Accessed October 16, 2015.