

## 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 traditional tobacco products like cigarettes, cigars, pipes, or common gadgets like flashlights, flash drives, or pens.

ENDS are battery-powered; some brands can be recharged via a USB port, others are disposable. ENDS contain a vaporizer (also called an atomizer), which is the piece that heats the liquid stored in the cartridge (where the flavored liquid is stored). Disposable ENDS do not require charging, changing batteries or cartridges, last roughly as long as two packs of cigarettes, and are typically around \$10. Rechargeable 'starter kits' are usually around \$35, and typically last as long as a pack and a half of cigarettes before needing to be recharged. These estimates vary by brand and by the smoker's usage patterns. In both types of ENDS, vapor is exhaled from the end, mimicking the behavior of a regular cigarette. The flavor cartridge may contain up to 20mg of nicotine per cartridge<sup>1</sup>.

Some of the liquids used in an ENDS solution 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>2</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 by the US Food and Drug Administration (FDA), and no rigorous scientific studies have shown that they are safe for use.

### **Types of ENDS**

#### **Rechargeable e-cigarette**



Image courtesy of Legacy

#### **Disposable e-cigarette**



## ENDS devices compared to traditional tobacco products



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

### **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. 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- In September 2013, health organizations banded together to send President Obama a letter requesting that he urge the FDA to take action on regulation of e-cigarettes<sup>3</sup>. Less than a week later, forty state Attorneys General sent a joint letter to FDA Commissioner Margaret Hamburg requesting regulations on e-cigarettes by the end of October 2013<sup>4</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. The Academy urged the FDA to adopt marketing restrictions on all tobacco products (e-cigarette companies are currently promoting their products on TV, radio, movies), to prohibit flavors other than tobacco in any product (no menthol, no flavored e-cigarettes), to immediately require child-proof packaging for liquid nicotine cartridges and include warnings on them about poisoning risks, advertising is not discussed in the deeming regulations, and to not allow re-branding of tobacco products (some cigarette manufacturers have added weight to their product to have them reclassified as cigars, which enjoy looser regulations)<sup>5</sup>.

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 traditional cigarettes, aid in tobacco craving/withdrawal symptoms, smoking cessation facilitator, and relapse avoidance<sup>6</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, and chocolate. These flavors have been banned in traditional cigarettes, but exist in e-cigarettes, and it's these flavors that have been shown to entice children<sup>7</sup>. Access to ENDS by minors is also a concern. As of early 2015, just over 41 states have passed laws prohibiting sales of these devices to minors<sup>8</sup>. 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>9</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>9</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>10</sup>. However, ENDS continue to be marketed as a way to smoke in places you can't 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 vapor is not harmless, and exposes bystanders to exhaled chemicals including nicotine<sup>11</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>12</sup>. These devices can also re-normalize smoking behaviors and cigarette use<sup>13</sup>. Children mimic what they see, and despite smoking rates decreasing over the last several years, rates of adolescent use may rise due to the uptick in adult e-cigarette use. There is also concern that e-cigarettes may cause a relapse for former smokers.

Also worrisome is that e-cigarette manufacturers are offering incentives to purchase their product. One e-cigarette company has a rewards program that gives discounts and free products from their rewards catalogue. Some manufacturers also offer recycling programs, where participants can earn free ENDS by mailing back old, used products. Coupons are frequently offered for these devices, and they have been available for purchase on discount sites like Groupon. Several tobacco companies in the US and abroad have either purchased or created their own brands of ENDS devices, including products like e-hookah or e-cigars. These products are available widely, both in stores 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 ads in television, radio, print media like magazines, billboards and outdoor signage, and internet and social media ads- all methods by which cigarettes have not been able to advertise since the 1998 Master Settlement Agreement<sup>14</sup>. This is also a concern due to the increased number of ENDS users- these devices mimic conventional cigarette use and help to normalize smoking behaviors. Because ENDS are offered in many child-friendly flavors, there is also a major risk of toxicity- the nicotine cartridges and refills pose a poison risk to children through ingestion or absorption through the skin. A child can be poisoned with very small amounts of nicotine- one teaspoon of highly-concentrated nicotine is enough

to kill a young child<sup>15</sup>. In 2014, poison centers in the US reported 3,831 exposures to e-cigarette devices and nicotine liquid<sup>16</sup>, compared to only 1,543 exposures in 2013<sup>17</sup>. In the first month of 2015, 387 exposures were reported, compared to only 200 in January 2014<sup>17</sup>. Some states have enacted legislation to require child-proof packaging<sup>18</sup>, and a bill to do this at the national level has been introduced and supported by the AAP.

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>.

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## CITATIONS

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