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Automated dripping devices for vapers: RDTA's, bottomfeeders, squonk mods, and dripboxes

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Introduction

The standard e-cigarette involves an electric heating coil that vaporizes a liquid solution consisting of propylene glycol and/or vegetable glycerin, flavorants, and, frequently, nicotine. Typically, the liquid is delivered to the heating coil via saturated wicking material. However, “dripping” is another method that involves the application of liquid to the coil of a Direct Drip Atomizer or Rebuildable Dripping Atomizer (RDA).^{1,2} Users report that dripping provides greater vapor yields, stronger throat hit, and a better flavor.³

Dripping is not without drawbacks. Notably, the higher temperatures involved may increase toxicant yield, although an update examining more contemporary designs may be needed.^{1,4} Additionally, dripping is time-consuming. It requires transferring liquid from a separate container to the coil.¹ This process must be repeated every few puffs to avoid “dry puffs” as the liquid is vaporized and the heating coil dries out. Dry puffs yield more toxicants, and may be accompanied by an aversive taste.^{1,5} Avoiding dry puffs by adding more liquid is challenging, as too much liquid “floods” the coil, preventing vapor production. Further, monitoring the amount of liquid consumed sometimes was challenging.

Automated Dripping Devices (ADD)

To circumvent the inconvenience of direct dripping, e-cigarette users and manufacturers have developed several novel technologies, referred to here as Automated Dripping Devices (ADD). Arguably, these include RDTA's (Rebuildable Dripping Tank Atomizers). RDTA's are advertised as offering the “best of both worlds.”⁶ As shown in Figure 1, this device typically includes a cotton wick inside the atomizer that reaches down into the tank below, allowing liquid to flow from the bottom through the cotton into the coil. Alternatively, users

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can apply liquid into the “drip tip” (mouthpiece).⁷ Figure 2 illustrates the two different methods of liquid application on another RDТА⁸ In other cases, distributors claim the device allows for the benefits of dripping, such as enhanced flavor, but with the practicability of a tank reservoir instead of dripping a few drops of liquid at a time.⁹ An additional claim is that these devices often use large amounts of coil and wick, which may allow for higher temperature use without overheating due to larger amounts of liquid available.

Another category of devices, sometimes referred to as “bottomfeeder” or “squonk mods”, more clearly provide a unique experience. Here, the liquid sits in a plastic bottle at the bottom of the device and squeezing (or “squonking”) the bottle feeds the liquid onto the coil. One purported advantage of this design is the large bottle reservoir. Initially, these devices were manufactured by e-cigarette enthusiasts. More recently, these devices have been mass produced (see Figure 3).¹⁰

Discussion

We know very little about dripping, RDТАs, and squonk mods. However, what we do know suggests that dripping may produce more toxicant-laden aerosol than standard e-cigarettes.^{1,5} There is some controversy regarding the levels of toxicants produced without dry puffs and the frequency of consumption of dry puffs by users.^{11,12} As a result of the lack of regulations and relative novelty of the e-cigarette market, considerable ambiguity exists regarding what devices are labeled RDТА’s. For example, one distributor may advertise a device as only involving a tank,¹³ while another distributor advertises a very similar — if not identical — device as a RDТА.¹⁴ Further research is needed to discriminate merely semantic differences in terminology from distinctions with relevant implications.

We know little about the prevalence of dripping and essentially nothing about the frequency of ADD use. A survey of high school students in Connecticut found that about a quarter of those who had ever used e-cigarettes also reported dripping.³ However, the item assessing dripping was criticized for its potential inability to discriminate between direct dripping and ADD.¹⁵ Surveillance efforts will require improved measures to allow for discrimination between different types of “e-cigarettes”.

There are at least two separate issues in need of further research. One involves how e-cigarette users refer to available devices. Some of this research, involving focus groups or internet surveillance, is ongoing,^{16,17} but is in need of further updates, particularly in relation to dripping. A second issue involves understanding whether different types of devices are distinct from one another in a way that alters health impact. For example, if “dripping” devices differ dramatically in health impact from non-dripping devices, understanding the prevalence of dripping will take on greater urgency. Regardless, current measures appear inadequate due to the lack of universal and clear definitions of different e-cigarette systems. The resulting ambiguity is a challenge to research and regulatory efforts, as well as to consumers attempting to make informed decisions regarding product purchasing. Thus, there is an urgent need for further research and discussion on this topic.

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References

1. Talih S, Balhas Z, Salman R, Karaoghlanian N, Shihadeh A. "Direct Dripping": A High-Temperature, High-Formaldehyde Emission Electronic Cigarette Use Method. *Nicotine & tobacco research: official journal of the Society for Research on Nicotine and Tobacco*. 2016; 18(4):453–459. [PubMed: 25863521]
2. Poklis JL, Mulder HA, Halquist MS, Wolf CE, Poklis A, Peace MR. The Blue Lotus Flower (*Nymphaea caerulea*) Resin Used in a New Type of Electronic Cigarette, the Re-Buildable Dripping Atomizer. *J Psychoactive Drugs*. 2017:1–7.
3. Krishnan-Sarin S, Morean M, Kong G, et al. E-Cigarettes and "Dripping" Among High-School Youth. *Pediatrics*. 2017; 139(3)
4. Kosmider L, Sobczak A, Fik M, et al. Carbonyl compounds in electronic cigarette vapors: effects of nicotine solvent and battery output voltage. *Nicotine & tobacco research: official journal of the Society for Research on Nicotine and Tobacco*. 2014; 16(10):1319–1326. [PubMed: 24832759]
5. Farsalinos KE, Voudris V, Poulas K. E-cigarettes generate high levels of aldehydes only in 'dry puff' conditions. *Addiction*. 2015; 110(8):1352–1356. [PubMed: 25996087]
6. Aromamizer RTDA by Steam Crave | Best of Both Worlds. [Accessed April 26, 2017] <http://www.evcigarettes.com/aromamizer-rtda-by-steam-crave/>
7. [Accessed June 8, 2017] Took a picture of my new Avocado 24 with simple 32ga*24ga dual claptons, I think the pic turned out great - Imgur. <http://imgur.com/nVGrc8k/>
8. Medusa RTDA | GeekVape. [Accessed April 26, 2017] <http://www.geekvape.com/project/medusa-rtda/>
9. What is the different between RBA / RDA / RTA / RDTA? [Accessed April 27, 2017] <https://www.vaporizersdistributor.com/blog/what-is-the-different-between-rba-rda-rta-rtda/>
10. Kanger DRIPBOX Starter kit - KangerTech. [Accessed April 28, 2017] <https://kangeronline.com/products/kanger-dripbox-starter-kit?variant=11471146117>
11. Shihadeh A, Talih S, Eissenberg T. Commentary on Farsalinos et al. (2015): E-cigarettes generate high levels of aldehydes only in 'dry puff' conditions. *Addiction*. 2015; 110(11):1861–1862. [PubMed: 26395030]
12. Farsalinos K, Voudris V, Poulas K. Response to Shihadeh et al. (2015): E-cigarettes generate high levels of aldehydes only in 'dry puff' conditions. *Addiction*. 2015; 110(11):1862–1864. [PubMed: 26395274]
13. Eleaf Lemo RTA - Discount Vape Pen. [Accessed April 27, 2017] <https://discountvapepen.com/product/eleaf-lemo-rta/>
14. Lemo RTDA from eLeaf Complete Kit with 5mL Capacity and tools. [Accessed April 27, 2017] <https://www.bigdvapor.net/products/lemo-rtda-from-eleaf-complete-kit>
15. Polosa, R. [Accessed June 8, 2017] RE: E-cigarettes and "dripping" among high-school youth: interpretation of the findings flawed by vague definition. *Pediatrics*. 2017. <http://pediatrics.aappublications.org/content/139/3/e20163224.comments>
16. Wagoner KG, Cornacchione J, Wiseman KD, Teal R, Moracco KE, Sutfin EL. E-cigarettes, Hookah Pens and Vapes: Adolescent and Young Adult Perceptions of Electronic Nicotine Delivery Systems. *Nicotine & tobacco research: official journal of the Society for Research on Nicotine and Tobacco*. 2016; 18(10):2006–2012. [PubMed: 27029821]
17. Pearson JL, Amato MS, Wang X, et al. How US Smokers Refer to E-cigarettes: An Examination of User-Generated Posts From a Web-Based Smoking Cessation Intervention, 2008-2015. *Nicotine &*

tobacco research: official journal of the Society for Research on Nicotine and Tobacco. 2017; 19(2):253–257. [PubMed: 27613899]

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Figure 1.

This image was found on Imgur.com, an online image sharing community. It apparently was posted by a user of the Avocado 24, a device manufactured by Geekvape Technology.

Figure 2.

This image was found on the webpage for Geekvape Technology, an organization with offices in both China and USA. This image was located in an advertisement for the Medusa RTDA under a heading of “MAIN FEATURES” and a subheading of “Drip refill system.”

KangerTech® DRIPBOX™ STARTER KIT

Subdrip and Dripmod

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Special features

1. Juice capacity 7.0mL
2. Replaceable 18650 cell
3. Replaceable dripping coil
4. Special battery cover design
5. Easy Juice filling, easy wicking
6. Max 60W output, drive 0.2 Ohm coil with all necessary mod protection

Replaceable coil (price same as OCC)

No more dropper

Squeeze

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Figure 3.

This advertisement was found on the webpage for KangerTech, an e-cigarette brand based in China.