ELECTRONIC SMOKING DEVICES

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***Abstract*- Electronic smoking devices (or ESDs), which are often called e-cigarettes, heat and vaporize a solution that typically contains nicotine. The devices are metal or plastic tubes that contain a cartridge filled with a liquid that is vaporized by a battery-powered heating element. The aerosol is inhaled by the user when they draw on the device, as they would a regular tobacco cigarette, and the user exhales the aerosol into the environment.**

***Index Terms*- adolescent, particulate matter, public policy, smoking.**

I. INTRODUCTION

Electronic cigarettes (e-cigarettes) are products that deliver a nicotine-containing aerosol (commonly called vapor) to users by heating a solution typically made up of propylene glycol or glycerol (glycerin), nicotine, and flavoring agents (Figure 1) invented in their current form by Chinese pharmacist Hon Lik in the early 2000s.The US patent application describes the e-cigarette device as "an electronic atomization cigarette that functions as substitutes [sic] for quitting smoking and cigarette substitutes*"* (patent No. 8,490,628 B2). By 2013, the major multinational tobacco companies had entered the e-cigarette market. E-cigarettes are marketed via television, the Internet, and print advertisements (that often feature celebrities)2as healthier alternatives to tobacco smoking, as useful for quitting smoking and reducing cigarette consumption and as a way to circumvent smoke-free laws by enabling users to "smoke anywhere.

Product	Description	Some Brands
Disposable e-cigarette	Cigarette-shaped device consisting of a battery and a cartridge containing an atomizer to heat a solution (with or without nicotine). Not rechargeable or refillable and is intended to be discarded after product stops producing aerosol. Sometimes called an e-hookah.	NJOY OneJoy, Aer Disposable, Flavorvapes
Rechargeable e-cigarette 	Cigarette-shaped device consisting of a battery that connects to an atomizer used to heat a solution typically containing nicotine. Often contains an element that regulates puff duration and /or how many puffs may be taken consecutively.	Blu, GreenSmoke, EonSmoke
Pen-style, medium-sized rechargeable e-cigarette 	Larger than a cigarette, often with a higher capacity battery, may contain a prefilled cartridge or a refillable cartridge (often called a clearomizer). These devices often come with a manual switch allowing to regulate length and frequency of puffs.	Vapor King Storm, Totally Wicked Tornado
Tank-style, large-sized rechargeable e-cigarette 	Much larger than a cigarette with a higher capacity battery and typically contains a large, refillable cartridge. Often contains manual switches and a battery casing for customizing battery capacity. Can be easily modified.	Volcano Lavatube

There has been rapid market penetration of e-cigarettes despite many unanswered questions about their safety, efficacy for harm reduction and cessation, and total impact on public health. E-cigarette products are changing quickly, and many of the findings from studies of older products may not be relevant to the assessment of newer products that could be safer and more effective as nicotine delivery devices. In addition, marketing and other environmental influences may vary from country to country, so patterns of use and the ultimate impact on public health may differ. The individual risks and benefits and the total impact of these products occur in the context of the widespread and continuing availability of conventional cigarettes and other tobacco products, with high levels of dual use of e-cigarettes and conventional cigarettes at the same time among adults4–8 and youth.9–11 It is important to assess e-cigarette toxicant exposure and individual risk, as well as the health effects, of e-cigarettes as they are actually used to ensure safety and to develop an evidence-based regulatory scheme that protects the entire population—children and adults, smokers and nonsmokers—in the context of how the tobacco industry is marketing and promoting these products.

Health claims and claims of efficacy for quitting smoking are unsupported by the scientific evidence to date. To minimize the potential negative impacts on prevention and cessation and the undermining of existing tobacco control measures, e-cigarette use should be prohibited where tobacco cigarette use is prohibited, and the products should be subject to the same marketing restrictions as tobacco cigarettes.

II. PREVALENCE

Awareness of e-cigarettes and e-cigarette trial have at least doubled among both adults and adolescents in several countries from 2008 to 2012. In the United States, awareness is more prevalent among men, but trying e-cigarettes is more prevalent among women. Almost the same percent of European Union and US adult respondents to national surveys reported having tried e-cigarettes (7% in 2012 versus 6.2% in 2011, respectively). All population-based studies of adult use show the highest rate of e-cigarette use among current smokers, followed by former smokers, with little use among nonsmokers, although e-cigarette trial and use rose in all of these categories.

III. CIGARETTE E-FLUID AND VAPOR

Chemical Constituents

The nicotine content of the cartridge e-liquid from some brands revealed poor concordance of labeled and actual nicotine content. Simulated e-cigarette use revealed that individual puffs contained from 0 to 35 μg nicotine per puff .Assuming a high nicotine delivery of 30 μg per puff, it would take ≈30 puffs to deliver the 1 mg nicotine typically delivered by smoking a conventional cigarette. A puff of the e-cigarette with the highest nicotine content contained 20% of the nicotine contained in a puff of a conventional cigarette. Actual nicotine delivery from an e-cigarette would likely be affected by users' smoking behavior. An analysis of UK brand e-cigarettes and the resulting aerosol demonstrated that, across brands, nicotine content of the e-liquid in the cartridges was not significantly correlated with the amount found in the resulting aerosol, indicating differences in the engineering characteristics of the device that strongly influence nicotine delivery even with a consistent puffing protocol.

IV. IS NICOTINE HARMFUL?

Nicotine is not the harmful ingredient in tobacco, it is the smoke that kills: the s moke and

Combustion artefacts cause lung cancer, heart disease and many other illnesses. Also,

Everyone tests positive for nicotine in the bloodstream, in very small amounts, since it is

a common ingredient in vegetables. A related material, nicotinic acid, is a vitamin Niacin

or Vitamin B3 so to say it is universally harmfull is obviously untrue. Without the smoke,

smoking is likely to be far less harmful, as nicotine may be as harmful as the caffeine in

coffee. Nicotine is best avoided by those who are pregnant or have heart disease. You

31 may want to avoid it if you also do not take caffeine or alcohol by drinking coffee, tea,

Wine or beer. Like these substances, it should probably not be started in the first place.

Some people however find their lives are dysfunctional without nicotine, and an

electronic cigarette is probably as good a way as any to supply it

V. EFFECTS ON CESSATION OF CONVENTIONAL CIGARETTES

As noted above e-cigarettes are promoted as devices to assist in smoking cessation and

many adults who use e-cigarettes are doing so because they believe that they will help them quit smoking conventional cigarettes. The assumption that e-cigarettes will be as effective, or more

effective , than pharmaceutical nicotine replacement therapy has also motivated s upport for e-

cigarette use among some public health researchers and policy makers and (as discussed later)

formed the basis for public policies on the regulation of e-cigarettes.

VI. NICOTINE ABSORPTION

Early studies of nicotine absorption in 2010 found that e-cigarettes delivered much lower levels of plasma nicotine than conventional cigarettes, whereas a more recent study demonstrated that more experienced users using their own product who engaged in more puff intervals have nicotine absorption similar to that with conventional

cigarettes, perhaps as a result of a combination of characteristics of the devices and user vaping topography. Another study of smokers smoking e-cigarettes using a specified protocol found a similar rise in serum cotinine immediately after use (mean increase, ≈20 ng/mL). Several studies reported that regardless of nicotine delivery, e-cigarettes can modestly alleviate some symptoms of withdrawal, and participants positively appraised the use of e-cigarettes. In a study comparing the nicotine inhalator and e-cigarettes, the nicotine inhalator delivered an amount of nicotine similar to that in the 16-mg e-cigarette; however, the authors noted that the e-cigarette malfunctioned and did not deliver any nicotine in a third of participants. These results highlight the need for product regulation in terms of drug delivery and effects, as well as device functioning and labeling.

VII. HEALTH EFFECTS

Propylene glycol and glycerin are the main base ingredients of the e-liquid. Exposure to propylene glycol can cause eye and respiratory irritation, and prolonged or repeated inhalation in industrial settings may affect the central nervous system, behavior, and the spleen. In its product safety materials, Dow Chemical Company states that "inhalation exposure to [propylene glycol] mists should be avoided, and the American Chemistry Council warns against its use in theater fogs because of the potential for eye and respiratory irritation. When heated and vaporized, propylene glycol can form propylene oxide, an International Agency for Research on Cancer class 2B carcinogen, and glycerol forms acrolein, which can cause upper respiratory tract irritation.

Major injuries and illness have resulted from e-cigarette use, including explosions and fires. Less serious adverse events include throat and mouth irritation, cough, nausea, and vomiting.

VIII. CONCLUSIONS

Although most of the discussion of e-cigarettes among health authorities has concentrated on the product itself, its potential toxicity, and use of e-cigarettes to help people quit smoking, the e-cigarette companies have been rapidly expanding using aggressive marketing messages similar to those used to promote cigarettes in the 1950s and 1960s. E-cigarette advertising is on television and radio in many countries that have long banned similar advertising for cigarettes and other tobacco products and may be indirectly promoting smoking conventional cigarettes. Although it is reasonable to assume that, if existing smokers switched completely from conventional cigarettes (with no other changes in use patterns) to e-cigarettes, there would be a lower disease burden caused by nicotine addiction, the evidence available at this time, although limited, points to high levels of dual use of e-cigarettes with conventional cigarettes, no proven cessation benefits, and rapidly increasing youth initiation with e-cigarettes. Although some cite a desire to quit smoking by using the e-cigarette, other common reasons for using the products are to circumvent smoke-free laws and to cut down on conventional cigarettes, which may reinforce dual use patterns and delay or deter quitting.

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