Background

Electric cigarette, also referred to as electronic nicotine delivery systems (ENDS) or ‘e-cigarettes’, generally consist of a power source (usually a battery) and heating element (commonly referred to as an atomizer) that vaporizes a solution (e-liquid). The user inhales the resulting vapor. E-liquids contain humectants such as propylene glycol and/or vegetable glycerin, flavorings and usually, but not always, nicotine. While most ECIGs contain the aforementioned basic components, there are a wide variety of ECIG models with substantial differences among them, such as the way in which the solution is stored, the method for heater activation, the electrical power flowing through (and dissipated by) the heater, and overall device appearance (Breland et al. 2014).

Electronic cigarettes, or “e-cigarettes,” are devices that consist of a battery-operated element which heats a mixture of propylene glycol, vegetable glycerin, liquid nicotine and flavorings for the user to inhale. Whereas their overall safety, as well as their role in smoking cessation, is the topic of ongoing debate. (Vasiljevic, Petrescu, and Marteau 2016). Smoking behavior in adolescents can not be separated from knowledge, perception or values or norms that are believed by an individual or a group that would affect a person's personality. From observation about their smoking habits teens more because of the want to try or follow the trend in the group, as well as the perception or belief, as in male smoking can increase the strength of men, the smoke will look more sociable, or smoking can increase the spirit study / work, smoking can relieve stress. (Sari, Pawiono, and Jombang, n.d.). Electronic cigarettes (e-cigarettes) are devices that typically look like regular cigarettes but
deliver vaporized nicotine without tobacco combustion. Public interest in e-cigarettes is skyrocketing, but these novel products are controversial among health professionals. Safety information is sparse and inconsistent, and regulation is in flux. Public health experts are currently divided about whether e-cigarettes are best understood as a potential harm reduction tool for current smokers or a “gateway” to nicotine dependence and, in turn, other tobacco use. (Pepper, McRee, and Gilkey 2014). Electronic cigarettes—also known as e-cigarettes, vapourisers, vape pens, e-hookah or ENDS (electronic nicotine delivery systems)—have quickly entered the global market. As cigarette sales in the USA decline, the use of smokeless and novel tobacco products is increasing. While e-cigarettes are currently a small part of the tobacco market, US sales have doubled every year since 2008, reaching approximately $2.5 billion in 2014 (Mcdonald et al. 2016). Electronic cigarettes (e-cigarettes or electronic nicotine delivery systems) are battery-operated devices designed to vaporize a liquid solution of propylene glycol or vegetable glycerine which also contains water and flavourings and may or may not contain nicotine (Saitta, Ferro, and Polosa 2014).

The Content of The Electric Cigarette

There was some discussion about whether e-cigarettes might be more or less addictive than traditional cigarettes and it was common for participants to acknowledge that they were unsure but that they would assume them to be less addictive than traditional cigarettes. Across the groups, participants offered a range of possible ingredients and chemicals that they thought e-cigarettes might contain, including: ‘oils’, ‘flavourings’, ‘water’, ‘nicotine’, ‘sugar’, ‘liquid anti-freeze’, ‘tar’, ‘carbon monoxide’, ‘alcohol’, ‘tobacco’ and other ‘bad things’. Ingredients were described as producing potentially harmful ‘toxins’, ‘poisons’ and ‘poisonous gases’. Despite uncertainties about the exact harms of e-cigarettes, there was general consensus that traditional cigarettes were more harmful than vaping, with vapour being “obviously not as harmful as the smoke (Hilton et al. 2016). Electronic nicotine delivery systems (ENDS), also called e-cigarettes or electronic cigarettes, are battery-operated devices that contain an inhalation-activated mechanism that heats a cartridge, producing vapour that the user, sometimes called a ‘vaper’, inhales. Liquid in the refillable cartridges typically has nicotine and humectants, although non-nicotine cartridges and disposable models...
are available. Notably, ENDS do not rely on combustion, meaning that users do not expose themselves or others to many of the harmful tobacco smoke constituents and particles produced by regular cigarettes. ENDS are controversial: safety information is sparse and inconsistent, regulation is in flux, and public interest is increasing rapidly despite the lack of research establishing ENDS’ long-term health effects or cessation properties for smokers. In addition, public health advocates are concerned that ENDS could act as a gateway to future smoking or prevent smokers from quitting by maintaining their nicotine addiction or deterring them from using existing, effective cessation tools. The ENDS literature is expanding rapidly, but to date no systematic review has summarised the findings across populations or identified gaps in the research. It is important to understand patterns of ENDS use across populations and time, and what beliefs and reactions drive either use or avoidance of ENDS. This review seeks to improve our understanding of who has used ENDS, how they feel about using them, and what both users and non-users think about this controversial product. (Caudle et al. 2016).

E-cigarettes are designed to deliver nicotine in an aerosolized manner that simulates an authentic smoking experience without the real smoke. In this respect, e-cigarettes are similar to the FDA-approved nicotine inhaler. Bullen et al. determined the Ruyan e-cigarette had a nicotine pharmacokinetic profile very similar to the Nicotrol inhaler, but the study’s participants thought the e-cigarettes were more pleasant to use and produced less irritation to the mouth and throat. For e-cigarettes, the nicotine is delivered through cartridges prefilled with a nicotine solution or cartridges that the user fills with a nicotine refill solution. In either case, the nicotine concentration of the solutions or cartridges can be purchased in strengths ranging from 0 to 24 mg or more, according to user preference. Unfortunately, the amounts of nicotine specified on the labels of various brands of e-cigarettes and solutions have not always been accurate or consistent (Palazzolo 2013).

**Contains Nicotine; Addictive**

Nicotine is the primary component of tobacco that maintains the smoking habit and develops addiction. The adaptive changes of nicotinic acetylcholine receptors produced by repeated exposure to nicotine play a crucial role in the establishment of dependence. However, other neurochemical systems also participate in the addictive effects of nicotine including glutamate,
cannabinoids, GABA and opioids (Pepper and Eissenberg 2014). This review will cover the involvement of these neurotransmitters in nicotine addictive properties, with a special emphasis on the endogenous opioid system. Thus, endogenous enkephalins and beta-endorphins acting on mu-opioid receptors are involved in nicotine rewarding effects, whereas opioid peptides derived from prodynorphin participate in nicotine aversive responses. An upregulation of mu-opioid receptors has been reported after chronic nicotine treatment that could counteract the development of nicotine tolerance, whereas the downregulation induced on kappa-opioid receptors seems to facilitate nicotine tolerance. Endogenous enkephalins acting on mu-opioid receptors also play a role in the development of physical dependence to nicotine. In agreement with these actions of the endogenous opioid system, the opioid antagonist naltrexone has shown to be effective for smoking cessation in certain subpopulations of smokers (Maldonado 2011). Participants were more mixed on their perceptions of the nicotine addiction warning label. High raters indicated that the statement was factual and straightforward, and would be important for individuals unaware that e-cigarettes contain nicotine and for warning smokers trying to quit that e-cigarettes were similarly addictive, a point that might deter some from wanting to use e-cigarettes. A few participants also noted that because some e-cigarettes do not contain nicotine, such a warning would help consumers know which product they were getting and its associated risks (Wackowski et al. 2016).

The Chemical Contents and Health Effects of Water Pipe Smoke and E-Cigarette Aerosol

E-Cigarette most chemical analyses and toxicology studies have examined the liquid found in e-cigarette cartridges or refill solutions rather than the aerosol emitted by the product. In the handful of studies focused on e-cigarette aerosol, results indicate that it contains nicotine and that it may also include some of the same toxicants as cigarette smoke, such as tobacco-specific nitrosamines and metals. However, the types and amounts of these substances vary considerably by brand, product, flavor, and battery output voltage (Kant et al. 2016).

One study characterized the amounts of certain toxicants in e-cigarette aerosol as between 9 and 450 times less than the amounts in cigarette smoke, although the levels of one particular carcinogen (formaldehyde) can match those found in tobacco smoke if the liquid in the e-cigarette is heated using higher
voltage batteries. The nicotine in e-cigarette aerosol effectively reaches the bloodstream of users, in some cases in concentrations that are similar to those seen in tobacco cigarette smokers. The toxicant levels in the secondhand aerosol inhaled by nonusers are unclear: one study detected only nicotine, whereas another detected a range of harmful pollutants in indoor air after the use of e-cigarettes (Pepper and Eissenberg 2014).

Conflict of Interest

None declared.

References


Sanders-Jackson, Ashley N., Andy S L Tan, Cabral A. Bigman, and Lisa Henriksen. 2015. “Knowledge about

