Electronic Smoking Products (ESPs)

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Electronic smoking products (ESPs), also called electronic nicotine delivery systems (ENDS) or Electronic Vaping Products (EVPs), are now widely available and are increasing in use, especially among people who smoke.[1] Commercially available worldwide since 2005, ESPs sales have grown dramatically.[2] The 2016-17 Canadian Student Tobacco, Alcohol and Drugs Survey identified that the prevalence of ever trying an e-cigarette had increased to 23% (~470,000) from 20% among Canadian grade 7-12 students.[3] Canada has one of the highest prevalence rates (72%) of ENDS use in currently smoking youth.[4] Statistics Canada identified that among Canadians aged 15 and up, 15% had tried an e-cigarette, with the highest rates (29%) among 20-24 year olds.[5]

The increasing marketing and use of these products has raised global public health concerns, particularly for youth and non-tobacco users.[4] On the other hand, there is emerging evidence that ESPs may be used as a harm reduction strategy for adults smoking tobacco.[6] The public health priority is how to balance a harm reduction potential for these products without expanding nicotine use among youth, people who do not smoke and other vulnerable populations.[7, 8]

Vaping

Vaping is a colloquial term that involves the inhaling and exhaling of the vapour (more correctly called an aerosol) produced by an ESP. [9] Common names of vaping products include electronic cigarettes (e-cigs), vapes, vape pens, e-hookahs, mods, sub-ohms, and tank systems.

Vaping products consist of a cartridge that stores a consumable (e.g., liquid solution), along with various devices (e.g. battery-operated heating element, atomizer, vaporizer). [6] The liquid solution usually combines propylene glycol or glycerin and flavourings with nicotine.[9] Devices may be the disposable type that resemble a cigarette or are a larger vaporizer (e.g., tank). The cartridges of ESPs can be replaced or refilled with liquid, commonly known as e-liquid, or e-juice. These liquids are available in a variety of different flavours and are available with and without nicotine. Statistics Canada (2017) reports that the majority of Canadians (64%) who have ever tried an e-cigarette report choosing those containing nicotine.[5] Nicotine content in ESPs vary greatly from low levels to those containing more nicotine than a regular cigarette depending on the device, cartridge and puff technique.[5, 10] Experienced ESP users can refine their puff technique (compensatory puffing) by taking frequent, longer puffs to significantly increase their dose of nicotine.[11] The inhaled (mainstream) and exhaled vapor contains particulate matter similar in size to smoke.[10]

Canadian Legislation

The Tobacco and Vaping Products Act (TVPA) that became law in Canada in May 2018 provides a framework for the manufacture, sale, labelling, and promotion of tobacco and vaping products. [6]

Tobacco and Vaping Products Act (TVPA)

The TVPA is designed to protect youth and people who do not use tobacco from nicotine addiction and use of tobacco, while allowing adults to legally access vaping products. This means that adults, ages 18 or older, can legally purchase vaping products that contain nicotine from retailers according to Canadian provincial and territorial legislation. The Act bans the sale of non-prescription vaping products to those under the age of 18 years and requires that online sellers must verify that the person taking delivery of the vaping product is at least 18 years of age. The TVPA requires child-resistant packaging for vaping liquids with nicotine to help protect children from nicotine poisoning. It prohibits the promotion of vaping products that are appealing to youth (e.g., flavours) and restricts the promotion of vaping products (e.g., lifestyle advertising, sponsorships and celebrity endorsements).

Finally, it requires plain and standardized packaging for tobacco products in order to make these less attractive and therefore less appealing, particularly to youth.[6] The TVPA does not include plain packaging guidelines for vaping products. However, it does require a toxicity warning for nicotine content over .01mg/g and prohibits the sale of anything equal to or above 66mg/g.

Key ESP messages

People that don't smoke: Vaping increases exposure to chemicals that are harmful to health.[12] Evidence finds that nicotine exposure during adolescence adversely affects cognitive function and development.[13] Nicotine is a potent and powerfully addictive substance, particularly for youth. Vaping products with nicotine leads to nicotine addiction, may act as a gateway to the use of tobacco products, and the renormalization of smoking behaviours.[14, 15, 16]

Health Advice: People who do not smoke need to understand the risks associated with vaping products, particularly those that contain nicotine. The brain is particularly susceptible to nicotine as it develops from birth through to the mid-twenties.[13] Vaping and exposure to vape should be avoided by all under the age of 25 years. Enforcement of restrictions prohibiting the sale of ESP with nicotine should be effectively enforced.

People who smoke: Tobacco use is the leading preventable cause of premature death and disease.[18] Therefore, quitting tobacco smoking is the best thing a person can do for their health. Evidence identifies that vaping products with nicotine do have harmful risks and although these products are now legal, it is still controversial as to whether or not ENDS provide a harm reduction option to smoking tobacco products.[9] Identified health risks associated with ENDS include cardiovascular and respiratory issues. The vapour also contains different harmful substances (e.g., formaldehyde, a known carcinogen) from those found in traditional cigarettes.[9] People who use cigarettes who switch completely to vaping products may reduce their exposure to toxic chemicals and carcinogens, while increasing their exposure to other harmful chemicals. [9, 19, 20, 21,22]

Vaping versus Tobacco Smoking

Currently, there is still controversy as to whether vaping is a safer and possibly a harm reduction strategy for adults currently smoking tobacco products.[10, 22, 23] Some health research identifies that vaping may be less harmful than tobacco smoking. First, ESPs do not contain tobacco and do not involve burning or producing smoke.[6, 19] Second, ESPs only contain a small fraction of the toxic and cancer-causing chemicals found in tobacco products or tobacco smoke. However, other researchers take a more cautious stance and state that ESPs might be less harmful than conventional cigarette products, but they still have health risks.[24, 25, 26, 27, 28, 29, 30, 31] The following sections identify some of the health risks of ESPs.

Health risks of vaping with nicotine

ESPs may pose risks, such as nicotine poisoning and addiction, and it is recommended that electronic products and cartridges be kept out of the reach of children to prevent potential choking incidents or nicotine poisoning.[6] Deaths of children from both ingestion of e-liquids and choking on e-liquid containers have been reported.[6]

The FDA Center for Drug Evaluation Division of Pharmaceutical Analysis conducted tests on ESPs and concluded that quality-control processes for manufacturing e-cigarettes are substandard or non-existent[32] and the concentrations of nicotine and other chemicals in the cartridges varied.

The FDA results showed that e-cigarette cartridges labeled as nicotine-free contained nicotine and that three different electronic cigarette cartridges with the same label produced markedly different amounts of nicotine with each puff. Some studies show that e-cigarettes can deliver substantial and even toxic amounts of nicotine[32] and other chemicals.

Health risks of other chemicals in vaping
There are health risks linked to other chemicals found in vaping products.

The main liquids in vaping products (vegetable glycerine and propylene glycol) are considered safe for use in many consumer products (cosmetics and sweeteners). The long-term safety of inhaling these substances in vaping products is unknown and continues to be assessed.

There is no burning during vaping, unlike during smoking, but the vaping process requires the liquid to be heated. This process can cause reactions and create new chemicals (such as aldehydes). Some contaminants (such as metals) might also get into the vaping products and then into the vapour.

The types and levels of these chemicals and contaminants can vary based on the type of device and the way the device is used. It has been shown that using vaping products with higher power and temperature settings can produce more chemicals. Some of these chemicals and contaminants are linked to negative health effects. However, they are normally at low levels in vapour, and much lower than in cigarette smoke. To date, the level of metals found in vaping product vapours isn't considered cause for significant safety concerns.

Although ESPs are generally reported to contain lower levels of toxic and cancer-causing compounds than tobacco smoke, they are not without health risks to both the users and those around them. Ultrafine particles in the vapour—mainly supersaturated propylene glycol (also known as 1,2-propanediol)—can be deposited in the lung. Propylene glycol is already used in asthma inhalers and other inhaled medications as well as artificial mist or fog in theatrical productions or films; it is “generally recognized as safe” by the FDA.[33] However, some studies have found reduced lung function and other respiratory problems in people in the entertainment industry who are chronically exposed to the aerosols.[34] Aerosolized nicotine seems capable of increasing the release of the inflammatory signaling molecule nitrous oxide upon inhalation.[35] Signs of airway constriction and inflammation are evident after only five minutes of use,[36] confirming the need for further testing of these products.[37]

Metals (e.g., nickel, cadmium and mercury) and other toxic compounds (e.g., diethylene glycol, formaldehyde and benzene)[38] have also been found in the e-liquids; some of these compounds occur as the result of users modifying their ESPs to operate at higher voltages.[39] It should be noted that the levels are much lower than those in tobacco smoke. Tobacco-specific constituents suspected of being harmful to humans (anabasine, myosmine and β-nicotyrine) were detected in most of the samples tested.[32, 38] Despite the lower levels of these compounds, the health effects of their long-term inhalation by ESP users have not been studied. It is generally accepted that more study of the long-term effects of aerosol inhalation and standardization of the manufacturing processes for both the ESPs and e-liquid are necessary.

Second-hand vapour
Bystanders can also be exposed to exhaled vapour and the health effects of this exposure are still unknown. Compared to tobacco smoke there are lower levels of chemicals in vapour. However, Health Canada recommends that people who use ESPs be cautious around those that do not use ESPs and youth.[6]

There is only limited evidence that e-cigarette use increases the level of nicotine and other chemicals on indoor surfaces.

Device malfunctions
In addition to the health hazards of the e-liquids, ESPs have been reported to explode and catch fire, which have caused injuries.[39] This is a particular problem with ESPs that have been modified to operate at higher voltages by users. Also, some people are reported to have used a different charging system than was provided with their ESP. More information on product safety is available in the TVPA document.[6]

Gateway to tobacco?
Several health organizations note that e-cigarettes can increase nicotine addiction among young people and are concerned that the use of e-cigarettes may lead young people to experiment with conventional tobacco products.[9, 14, 15, 16] These groups note that products have not been adequately tested for consumer use, and the full short- and long-term health effects of using these products are unknown.

The unproven claims of safety made by many manufacturers may be a contributing factor to the rise in popularity of these products.

Harm Reduction and Cessation
While stopping tobacco use completely is the ideal, this is very challenging for many people. The use of licensed nicotine-containing products, such as nicotine replacement therapy (NRT) products, are a way of reducing harm for both the individual who smokes, and those around them who are exposed to tobacco smoke as a result. Electronic smoking/vaping devices that contain nicotine are now regulated in Canada for use by adults. Completely switching from smoking to using e-cigarettes can reduce exposure to toxic and cancer-causing chemicals, and e-cigarettes have been shown to help some people quit smoking. While not harm-free, across a range of studies and outcomes, e-cigarettes appear to cause less risk to an individual than combustible tobacco cigarettes.[2] Guidance for health professionals on supporting patients to reduce harms or quit smoking can be accessed through the Alberta Health Services Tobacco Harm Reduction – E-Cigarettes Clinical Support Primer (www.albertaquits.ca).

Quitting smoking can be difficult, but with pharmacotherapy, support, and counseling it is possible. For more information on quitting smoking, visit AlbertaQuits (www.albertaquits.ca) or call 1-866-710-QUIT.

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