

Evidence Brief: Communicable disease impacts of sharing electronic-cigarettes with drip tips



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Issue and Research Question

Electronic cigarettes (e-cigarettes) are battery powered devices that generally use a heating element (an electric atomizer) to vaporize liquid solution (also called the “e-liquid”) in the replaceable cartridge into an aerosol which is then inhaled through the mouthpiece by the user.¹ Propylene glycol is the main ingredient in the e-liquid used to produce vapour, and e-liquid may also contain nicotine, flavouring agents, or a mixture of both.¹ E-cigarettes with nicotine are also called electronic nicotine delivery systems (ENDS), which mimic conventional cigarettes.¹

In Canada, e-cigarettes containing nicotine are regulated under the *Food and Drug Regulations*.² Evidence of safety, quality and efficacy must be demonstrated before Health Canada will approve for marketing; to date no products have been approved. E-cigarettes that

do not contain nicotine can be sold in Canada and are subject to *the Canada Consumer Product Safety Act*.³ Manufacturers and suppliers must ensure their products do not pose any danger to human health and safety.⁴

Currently there are no prevalence estimates in Canada for e-cigarette use. However, a recent study of 4 countries, which included Canada, showed that 40% of Canadians (N=1581) surveyed were aware of ENDS, 10% of whom had tried them.⁵

Literature on the toxicology, safety, and benefits and harms of e-cigarette use is limited, including their potential utility as an aid for tobacco cessation, or conversely, whether they may be a “gateway” to traditional cigarette use. The potential risks associated with inhaling the vaporized aerosol mixture present in the e-cigarette or its effectiveness on smoking

cessation are unclear.¹ For example, one study found metal and silicate particles in the aerosol, which indicates that there is a need for quality control in the design and manufacture of e-cigarettes as well as research on the potential health impacts of e-cigarette use.⁶

A potential risk for communicable disease transmission through the sharing of e-cigarette drip tips has been identified. Drip tips are designed to attach onto an atomizer allowing users to directly drip the e-liquid onto the atomizer bridge without the use of a cartridge and mouthpiece.⁷ Ontario health units have noted that certain retailers offer customers the opportunity to sample different e-cigarette flavours prior to purchase, using disposal drip tips. Although the drip tip is designed to prevent physical contact of the users' lips onto the inhalation end of the e-cigarette and the mode of action is inhalation rather than exhalation, there are concerns with respect to sharing the e-cigarettes among different individuals. Furthermore, although glycol vapours have the ability to temporarily reduce numbers of airborne bacteria when an adequate amount is properly and continuously dispensed by a vaporizing device at concentrations of at least 5% under ideal conditions,⁸ the potential bactericidal properties of propylene glycol dispensed through e-cigarettes are unknown. Propylene glycol has also been used as food preservatives as well as bactericide and fungicide in cosmetic preservative along with other chemicals.⁹

This Evidence Brief asks: Is there a risk of contaminating the inside of the e-cigarette and/or disease transmission among clients who share the same e-cigarette with drip tips?

Methods

A search of PubMed, Embase and Medline databases was conducted between January 4 and February 28, 2014. A grey literature search using the Google Scholar search engine was also conducted at the same time. Search terms included 'e-cigarette', 'mouthpiece', 'drip tip', 'waterpipe', 'hookah', and 'microbial and cross-

contamination'. English-language articles retrieved by this search were assessed for eligibility by PHO staff. Full text articles were retrieved, reviewed and relevant information was extracted from each article. The full search strategy can be obtained from PHO. Experts from Health Canada were consulted for accuracy of content and additional resources (March 2014).

Main Findings

The search yielded 63 abstracts. No articles directly addressed the research question outlined above. However, eight primary studies retrieved provided evidence of microbial contamination and disease transmission through devices with similar modes of action, such as waterpipe smoking and asthma inhalers, which all involve the use of a mouthpiece and inhalation.

For example, the acquisition of tuberculosis has been linked to smoking due to shared use of mouthpiece/waterpipe and/or confinement in a shared airspace (i.e., in a car or closed room).¹⁰⁻¹² It is important to note that relative contributions of the shared use of waterpipe and shared airspace for a prolonged period of time for TB acquisition could not be separated.¹⁰ Nevertheless, the air contained in the pipe, which is rebreathed, offered a potential route for TB transmission.¹⁰

Similarly, studies of asthma inhalers have also shown that rates of microbial contamination of the spacer reservoir and mouthpiece have ranged from 35.5% to 80% of the devices tested, and it has been noted that many of the microbes found possess pathogenic properties that could lead to pathogenic diseases and/or opportunistic infections.¹³⁻¹⁶ For example, among children who had pneumonia during an acute asthma exacerbation, all had contaminated spacer devices.¹⁴ Another study found 73% of the nebuliser sets were contaminated with moderate to heavy growth of bacteria. Although not all of the nebulisers with a contaminated mask/mouthpiece had contamination in the chamber or the tubing, it

is important to note that bacteria can be transmitted further into the device. Moreover, the heavy growth of bacteria was mainly found in the chamber rather than the mask/mouthpiece.¹⁷ Consistent with the studies above, pathogenic bacteria were identified, and patients with nebulisers contaminated with potentially pathogenic bacteria had significantly higher occurrences of exacerbations over 12 months.¹⁷

Discussion and Conclusions

It is apparent that devices that come in contact with the mouth are candidate sites for harbouring microbial growth, and that sharing of such equipment may increase the risk of virus and pathogen transmission. Although drip tips are designed for individual use only, it is possible that bacteria transmitted to the tips from individual users could transmit further into the e-cigarette, making it a potential reservoir for delivering pathogens to the lungs along with the aerosols produced upon inhalation. Finally, the potential bactericidal role of propylene glycol, the main ingredient of e-liquid as dispensed through e-cigarettes, is unknown.

The lack of research in this field limits our ability to fully understand the overall risks associated with e-cigarettes, including the sharing of e-cigarettes and the use of disposable drip tips. More research is needed before we are able to provide comprehensive evidence-based recommendations or a suitable preventative measure.

Specifications and Limitations of Evidence Brief

This Evidence Brief presents key findings from the scientific literature. Its purpose is to investigate a research question in a timely manner to help inform decision-making. This report is not a comprehensive review of the literature, but rather a rapid assessment of the best available research evidence. There may be relevant pieces of evidence that are not included and these may alter the conclusions drawn from the document.

Additional Resources

Additional resources retrieved while developing this Evidence Brief that may be of interest to readers:

Malone RE, Hyland A, editors. FDA e-cigarettes: impact on individual and population health. *Tob Control*. 2014; 23 Suppl 2:ii1-ii58.

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