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Commentary on Brose et al. (2015): Protecting individual and public health by regulating electronic cigarette nicotine delivery

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Brose and colleagues [1] used a national data set from Great Britain to demonstrate that, in current tobacco cigarette smokers, daily but not non-daily electronic cigarette (e-cig) use shows a significant association with increased tobacco smoking cessation attempts and reductions in smoking behavior. However, e-cig use was not shown in this study to be associated significantly with tobacco smoking cessation. Taken together, this new study [1] and the extant literature (e.g. [2, 3]) provide little empirical support for the contention that e-cig use leads reliably to smoking cessation for the majority of users.

Tobacco cigarette smokers self-administer the stimulant drug nicotine with every puff that they inhale, and most of them are dependent on the drug [4]. This dependence makes cessation difficult, in part because of an aversive abstinence syndrome that occurs during a cessation attempt (e.g. [5]). Nicotine replacement medications act by delivering nicotine to the user and thus suppressing at least some aversive abstinence symptoms: the more nicotine, the greater the symptom suppression (e.g. [6]). E-cigs are not marketed as medications in many countries, but are a class of products that use an electric heater to aerosolize a liquid that usually contains some combination of propylene glycol, vegetable glycerin, flavorants and nicotine. Despite not being marketed as medications, many smokers are attempting to quit tobacco cigarettes by using e-cigs daily; however, there is little information regarding the long-term health risks associated with daily e-cig use. Putting aside that concern, if daily e-cig use is to lead to smoking cessation for the majority of users, then e-cigs will probably need to deliver nicotine in doses necessary to suppress abstinence symptoms as effectively as a tobacco cigarette. Unfortunately, there is wide variability in e-cig nicotine delivery: 10 puffs from an e-cig may, for example [7], or may not [8], result in reliable nicotine delivery to the user's blood. Differences across studies can be explained by a combination of factors, including characteristics of the e-cig device and liquid, as well as user behavior [9]. Those e-cig device/liquid combinations that are most likely to lead to smoking cessation may well be those that approximate the nicotine delivery profile of a tobacco cigarette (e.g. [10]).

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Declaration of interests

None.

Strangely, e-cigs that are far less effective at delivering nicotine continue to be marketed to smokers. For instance, 50 puffs from either of two Blu e-cig (Lorillard, Inc., Greensboro, NC, USA) models that are currently available on the US market deliver 23–53% less nicotine to the user relative to approximately 10 puffs from a conventional tobacco cigarette [11], yet Blu e-cig brands are rated as the most popular among US young adults [12]. Perhaps relatedly, more than 80% of all US televised e-cig advertisements geared toward youth and young adults were for Blu e-cigs [13], and 90% of all US advertising expenditures for e-cig brands have been for Blu E e-cigs [14]. The fact that some e-cigs that are advertised to youth and young adults actively also deliver very little nicotine is reminiscent of so-called ‘starter products’ common in the smokeless tobacco arena [15]. Starter products allow nicotine-naive users to self-administer low doses of nicotine without experiencing drug-mediated adverse side effects and then, as tolerance develops, these users can ‘graduate’ to products that deliver increasing doses of the drug (e.g. [15]). Public health policy-makers may want to recall this industry strategy when considering regulatory action regarding e-cigs.

Further complicating this issue is that at least 466 distinct brands of e-cigs are marketed currently [16], some by major tobacco companies. Tobacco companies in particular may be interested in smokers who purchase an e-cig as part of a smoking cessation strategy but, as Brose et al.’s [1] data suggest, ultimately do not quit smoking, perhaps because the e-cig they bought underperforms a tobacco cigarette in terms of nicotine delivery to the user. Under this scenario, the tobacco company that sells the under-performing product profits from sales of e-cigs and tobacco cigarettes, while the smoker who purchased the under-performing product in addition to tobacco cigarettes continues to be at risk for tobacco-caused disease and death.

Much has been written about the potential for e-cigs to provide public health benefit through a dramatic reduction in tobacco cigarette smoking (e.g. [17]). This potential benefit may require science-based regulatory intervention to ensure that e-cigs deliver nicotine effectively to cigarette smokers, while avoiding e-cig-induced nicotine dependence in non-smokers via the starter product strategy. Also, some e-cig device/liquid combinations on the market today may deliver nicotine more effectively than the highly addictive tobacco cigarette [18]; there is no clear public health rationale for such products, and regulation can help to limit their availability. Relevant foci for regulatory intervention that address drug delivery include product characteristics [9] and nicotine flux [19]. Without meaningful, science-based regulation, there may be many future opportunities to report, as do Brose et al. [1], that e-cigs are not effective tools for helping the majority of smokers to quit using lethal tobacco cigarettes.

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