

Commentary on Etter & Bullen (2011): Could E-cigs become the ultimate nicotine maintenance device?

Smoked tobacco products are the only legal products that kill half their consumers, and some of those around them, when used as intended. More than 17 billion cigarettes are smoked world-wide every day, and that number continues to increase [1]. People smoke for the psychoactive and addictive effects of nicotine, but are killed by other toxins in the smoke [2,3].

Almost 20 years ago in this journal, the following comment was made on 'the ultimate nicotine replacement device':

If people have difficulty overcoming both nicotine dependence and long-term habit change, then surely the solution is to help them avoid most of the health risks with only a minimal alteration in their nicotine-seeking habits. This implies a nicotine replacement device which looks like a cigarette and delivers cigarette-like boli of nicotine, but does not deliver the tar and carbon monoxide which cause the vast majority of smoking-related disease . . . the development and promotion of such a product (and its eventual replacement of tobacco) could have massive beneficial public health implications lasting into the 21st century [4].

Might electronic cigarettes (e-cigs) be the product that could replace regular cigarettes and prevent millions of premature deaths? Although e-cigs were perceived initially as something of a gimmick that was likely to be banned, their increasing popularity and resistance to regulatory efforts suggest that it is more likely they are here to stay.

As e-cigs are sold largely via the internet, it is difficult to estimate total sales. Two US companies reported selling 735 000 e-cigs in just over a year [5], and among recent UK smokers 9% had used e-cigs and 3% were still using them [6]. In 2010, internet searches for e-cigs were several-hundred-fold greater than searches for medicinal nicotine therapy products [7]. E-cigs obviously look like a cigarette, and do not deliver tobacco tar or carbon monoxide, but questions remain about their nicotine delivery and regulatory status.

Early laboratory studies of e-cigs found meager nicotine delivery [8,9]. However, Etter & Bullen [10] concluded that e-cigs are being used as aids to smoking cessation much as people use nicotine replacement medications. Preliminary results from a study in which experienced e-cig users were allowed to use their own

(customized) e-cigs reported that they achieved cigarette-like increases in blood nicotine concentration (>10 ng/ml in 5 minutes) [11].

This and other studies [10,12,13] suggest that some e-cigs are capable of cigarette-like nicotine delivery and so it is important that their potential to improve public health be given due consideration. Clearly, further research is necessary to clarify the best direction for e-cig regulation [14]. Electronic cigarettes are already banned in some countries (e.g. Brazil). Other countries have attempted to restrict their sale or importation (including the United States). Meanwhile, these same countries permit the sale of regular cigarettes, in the certainty that those real cigarettes will cause the premature death of about half of long-term users. Is banning the appropriate response to e-cigs while allowing toxic cigarettes to dominate the nicotine market?

E-cigs should be allowed to compete for the middle ground between highly toxic smoked tobacco products and smoking cessation medicines that have been demonstrated to be safe and effective for that purpose [15]. Thus e-cigs are currently competing for the smoke-free nicotine maintenance market, primarily against other smokeless tobacco products such as snuff, snus and dissolvable tobacco products [2,16,17]. How successful they are in competing in that market-place will depend upon whether manufacturers can mass-produce and market relatively low-cost, safe, reliable and user-friendly products with adequate nicotine delivery. They should be regulated to ensure that they do not deliver toxic chemicals unnecessary to their purpose (e.g. quality control measures should ensure no contaminants are in the liquid or vapor), and are as safe as technically possible (e.g. liquid should be in a child-proof container, and instructions for use should be clear and accurate) [18].

Currently, the e-cig market is awash with numerous, sometimes low-quality products, and users need to navigate a personal and online learning curve to find a good product [13,18]. Improved quality-control, including assessment of nicotine delivery, will be necessary for smokers to be able to switch comfortably and confidently to e-cigs in large numbers.

Tobacco regulation in the United States appears to be moving slowly towards the 'reduced nicotine' model [19]. This model would require cigarette manufacturers to reduce the nicotine content to the point where cigarettes are no longer addictive (current US legislation does not allow nicotine to be banned completely, but does allow

any other chemical to be eliminated). E-cigs demonstrate the feasibility for a 'reduced toxin' model, allowing nicotine to remain, but requiring manufacturers to eliminate delivery of the other toxic chemicals that harm health [3]. Whichever model prevails, it is unlikely to be successful if it does not provide smokers with an acceptable alternative nicotine product to switch to. E-cigs have the potential to become such a product.

Declarations of interest

Neither of the authors have any financial connections with the tobacco or electronic cigarette industries. Their salaries are paid by The Pennsylvania State University. J.F. has worked as a paid consultant for companies involved in the production of pharmaceutical products as aids to smoking cessation (e.g. Cypress Bioscience, GSK, Novartis, Pfizer) and as an expert witness in litigation against tobacco companies.

Keywords Cessation, dependence, e-cigarette, electronic cigarette, nicotine, smoking.

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