

Electronic cigarettes: fact and fiction

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There are a number of public health advocates who vigorously oppose electronic cigarettes (e-cigarettes) [1-4] and bodies such as the BMA and the WHO are warning smokers against using them [5]. This editorial takes a close look at the evidence.

E-cigarettes' are devices that are designed to give much of the experience of smoking and usually a certain amount of nicotine without exposing the user to the highly carcinogenic tar and harmful carbon monoxide gas that cigarettes deliver [6]. Many of them look broadly similar to cigarettes but are often larger and sport different colours; some look very different from cigarettes. Some have a tip that glows red, blue or green when the user sucks on them. They contain a battery-powered heating element which is activated either manually or automatically when the user sucks on the end. This element heats a liquid mostly made up of propylene glycol or glycerol, usually with some nicotine and flavourings. The resulting vapour is inhaled and delivers varying amounts of nicotine, typically less than from smoking, depending on the device and experience of the user [7-10]. Some of the vapour is exhaled as a visible mist.

Given that smokers smoke primarily for the nicotine but die primarily from the tar [11], one might imagine that e-cigarettes would be welcomed as a means to prevent much of the death and suffering caused by cigarettes. For every million smokers who switched to an e-cigarette we could expect a reduction of more than 6,000 premature deaths in the UK each year¹, even in the event that e-cigarette use carries a significant risk of fatal diseases, and users were to continue to use them indefinitely.

This raises the question as to why some in the public health community are so vociferous in their opposition to them. One concern is over safety. Given how long it took to discover the link between smoking and lung cancer when the risks were so great, we have to accept that it will probably be more than 30 years before we would have a chance of being able to use epidemiology to quantify risks from e-cigarette use. In fact we may never be able to do so because we are chasing a moving target in terms of the products and their development.

This means that we must make judgements based on the toxicology of the vapour. Despite alarmist commentaries, studies on the toxicology of the vapour tell us that, while propylene glycol is an irritant and some toxins are present in measurable quantities, the concentrations are in fact very low [e.g. 12]. Some reviews have bizarrely concluded that we do not know whether e-cigarette use is safer than smoking [e.g. 13], ignoring the fact that the vapour

¹ At current smoking prevalence of around 19%, the 9 million smokers will correspond to a long term death toll of 60,000 per year, or about 6,670 premature death per year for every million smokers. Even in the unlikely event that e-cigarettes carried a significant risk of death, say 1/20th that of cigarettes at the upper end, this would reduce to 330 premature deaths per year for every million smokers saving more than 6,000 lives.

contains nothing like the concentrations of carcinogens and toxins as cigarette smoke [14, 15]. In fact, toxin concentrations are almost all well below 1/20th that of cigarette smoke.

The second concern is that widespread use of e-cigarettes may ‘re-normalise’ smoking leading to an increase in smoking prevalence, or at least a slowing down of the rate of decline. Yet, in England, where the ‘Smoking Toolkit Study’ surveys the adult population every month, the rise in prevalence of e-cigarette use has been accompanied by an increase in smoking *cessation* rates and a continued fall in smoking prevalence [16, 17]. The proportion of those between 16 and 25 who have ever smoked regularly has stayed constant at 30% over the period when e-cigarette use has increased [16].

The third concern is that there is only limited scientific evidence that e-cigarettes can help smokers to stop smoking. Two randomised controlled trials of now obsolete products which delivered little nicotine found those products to yield success rates broadly similar to licensed nicotine products [18, 19]. More trials of newer products are needed but these will only give us part of the answer. The number and variety of products, the rate of development, the time taken to conduct these trials and the difficulty in generalising to people who are not willing to be randomised mean that we will have to supplement randomised trials with other kinds of study.

A review of surveys suggested that e-cigarette use by smokers might hinder quitting but the studies reviewed could not address the question satisfactorily because they failed to address differences in important factors such as nicotine dependence among using e-cigarettes versus other smokers, and/or did not address whether the e-cigarettes were used as part of a quit attempt [14]. A recent study has addressed these deficiencies [17]. It used a survey methodology that had previously confirmed RCT findings that behavioural support, and licensed nicotine products and varenicline obtained on prescription all improve smokers’ chances of stopping, while confirming findings from other studies that licensed nicotine products when bought over the counter may not improve the chances of stopping [20, 21]. The latest study, involving almost 6000 respondents, found that use of an e-cigarette in the most recent quit attempt was associated with a 60% increase in the odds of still being abstinent compared with using no aid and with using a licensed nicotine product bought over the counter [17]. This difference persisted after adjusting statistically for a wide range of potential confounding variables. This is just one correlational study but it is an important piece of the jigsaw.

The fourth concern is that e-cigarettes may act as a gateway into smoking. The gateway hypothesis has been widely debated in relation to ‘soft’ and ‘hard’ drugs and it has been recognised that simply counting the numbers of people who try a ‘soft’ drug and go on to use a ‘hard’ drug does not address the question [22]. The reason is obvious; the association could easily be due to a pre-existing disposition on the part of the people concerned. To date studies that have been claimed as addressing the gateway issue in relation to e-cigarettes have not in fact done so [e.g. 1]. Moreover, warnings about a rapid rise in e-cigarette use among the young have been based on the proportion of young people who report ever having tried an e-cigarette not the proportion of current users [e.g. 23]. In England, the proportion of current users in people who have not smoked regularly remains extremely small at 0.2% [16].

This brings us back to the question as to why some individuals and bodies involved in public health are so opposed to e-cigarettes. It may be a concern over how things might turn out in

the future given commercial incentives, puritanical ethic, distaste for any industry profiting from a psychoactive drug, inappropriate application of a medical rather than a public health model, or even just a gut feeling that e-cigarettes are bad. Whatever the reasons, it is important that interpretation of the evidence and communication with policy makers and the public not be distorted by a priori judgements [24].

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