The symposium ‘[A nasty case of the vapours - E-cigarettes friend or foe?](https://jp.msubmit.net/cgi-bin/main.plex?form_type=ss_subfolder&j_id=486&ms_id_key=312ftdxJcRoqNfrfy1qdEkFnuH3g&ft_key=F4JlcOnTEEG1KEFcR59wSw&ss_id=71&role_id=20)’ took place at the Physiological Society Conference 8-10 July 2019 in Aberdeen. The symposium was sponsored by the Journal of Physiology and the following reviews were an outcome of the presentations at the symposium.

E-cigarettes are a common form of electronic nicotine delivery systems (ENDS), which are used as a tobacco free nicotine delivery system. These devices utilise a liquid solution (e-liquid) which is drawn over a heating element to produce a vapour which is then inhaled. Hence, the term ‘vaping’. The solution normally contains humectants such as vegetable glycerine and propylene glycol to generate the vapour and act as carriers for nicotine and a huge range of flavourings. E-cigarette usage has increased significantly in the past 10 years in former tobacco smokers and more concerningly, never smokers.

There is much debate around the safety of E-cigarettes and their benefit as a tool for quitting tobacco products and reducing nicotine addiction, with all sides being equally passionate in their arguments. Since E-cigarettes do not generate harmful tar products associated with burning tobacco, their constituents are perceived and promoted as less harmful, and to date, the regulation of ENDS and e-liquids by legislative bodies has been slow and not extensive. But as outlined in these reviews, vaping is not harmless. This was recently highlighted by the finding that most, but not all, cases of vaping product use associated lung injury (EVALI) were linked to vitamin E acetate used in tetrahydrocannabinol (THC) containing vape products.

The excellent reviews presented here chronical the rapid development of ENDS from their simple beginnings mimicking cigarettes to the slick nicotine delivery systems that are currently available. They all, unanimously, provide evidence for E-cigarettes causing changes to normal lung physiology, such as alterations to gas exchange, airway resistance, airway reactivity, airway obstruction, inflammation and emphysema and propose additional consequences for people already suffering from respiratory conditions such as asthma, COPD and bronchiectasis.

*Mayashita and Foley* provide detailed evidence for the effects of E-cigarettes on respiratory physiology and tackle the additional debate on whether exhaled vapor (second hand vapour, SHV) could have consequences for respiratory health. The review also provides evidence that E-cigarettes may additionally increase susceptibility to respiratory infection by increasing bacterial adhesion to airway cells and reducing inflammatory cell activity.

The effects of vaping are not however, limited to the lungs. The review by *Tsai, et al* shows that E-cigarette aerosols affect cardiac and vascular physiology, inducing changes in blood pressure and heart rate that are similar to those induced by traditional cigarettes. They also cite studies demonstrating increased arterial stiffness, vascular endothelial changes, increased angiogenesis, cardiorenal fibrosis and increased atherosclerotic plaque formation, factors with important consequences for long term health.

Many studies propose nicotine as the key perpetrator of local and systemic changes, although nicotine free e-liquids are not guilt free. The review by *Herman and Tarran* focusses directly on the effects of nicotine and its action via nicotinic acetyl choline receptors (nAChRs) on lung and brain physiology. Interestingly, they report that nicotine levels are higher in the lungs of vapers compared to smokers. They consider how this, and changes to cell signalling pathways, lead to central and peripheral adaptations to nicotine exposure with detrimental effects on brain reward pathways associated with nicotine addiction, lung and inflammatory cell function.

One of the most challenging issues with E-cigarette research is the wide variety of e-liquids, devices and frequency of use by individuals, and how this is translated into laboratory/clinical studies with meaningful outcomes. The review by *Markzylo* draws attention to the issues associated with the doses and *in vivo* models used for testing systemic effects of E-cigarette vapour. By analysing a wide range of outcome measures, *Markzylo* suggests that there is clear evidence for systemic effects of vapour containing nicotine (extending additionally to the bladder and male fertility) but surmises that E-cigarettes are less harmful that traditional cigarettes.

What these reviews universally highlight and call for, is the need for more research to better understand the effects of vape constituents on human physiology and in particular long-term chronic exposure studies. It took decades for the harm of tobacco smoking to be exposed and understood. E-cigarette research is still in its infancy. Even if current studies support that vaping is less harmful than smoking, the long-term consequences for individual health and costs to society still need clarification and may not be revealed for decades. Whatever the outcomes, research, as outlined in these reviews will lead to better regulation, advice and more informed choices for E-cigarettes users.

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