

# Science for Environment Policy

## E-cigarette waste poses potential environmental risks

**Disposable components** of Electronic Nicotine Delivery Systems (ENDS), such as e-cigarettes and e-pens, could pose a potential environmental risk unless properly regulated, suggests new research. The study examined the levels of potentially toxic chemicals in disposable battery and 'cartomiser' ENDS components.

**ENDS are becoming increasingly popular in Europe**, partly due to their perceived health benefits over tobacco and to help smokers quit or cut down. They come in many different forms, both reusable and disposable, but typically include lithium-ion batteries (LIBs), metal casings, wires, plastics and 'cartomisers' — replaceable cartridges which contain the vaporisable nicotine liquid.

However, like traditional cigarette filters, disposal of used ENDS components could pose a potential environmental hazard. The new research investigated the 'oxidant or bleaching reactivity' of disposable ENDS components. Oxidants, also known as free radicals, are chemicals which can lead to chemical and DNA damage, and are capable of causing harm to living organisms.

The researchers focused on the two main parts of ENDS likely to be disposed of: LIBs, which contain heavy metals with known toxic effects, and cartomisers.

Without proper disposal, both LIBs and cartomisers could release additional chemicals to the environment. These could accumulate alongside those in discarded cigarette filters, which are harmful to animals and plants.

The researchers used a chemical called DCFH (2'-7'-dichlorodihydrofluorescein) and Electron Pulse Resonance to detect the presence of oxidants in ENDS cartomisers, LIBs and vapour. DCFH undergoes a chemical reaction when exposed to oxidants, making it fluorescent. The amount of fluorescence is related to the amount of oxidant present.

They found a significant increase in DCFH fluorescence following exposure to disassembled cartomisers, indicating the presence of oxidants. There was no difference between used and unused cartomiser components, suggesting that both are sources of oxidants.

Used LIBs components also demonstrated similar oxidant activity to cartomisers. However, the researchers did not test unused batteries, so it was not clear if oxidant activity was due to the use of the batteries, or if it was an inherent feature of the batteries.

Aerosols produced by the ENDS themselves were also tested. This resulted in a significant increase in DCFH fluorescence compared with air alone.

Overall, the cartomisers, LIBs and vapour showed oxidant reactivity similar to conventional cigarette filters and may pose a risk to the environment, the authors say, which needs to be further examined in future research.

They do note that they did not test a wide range of different ENDS, and results are likely to vary between manufacturers, and depend on the specific vapour liquid flavouring used. Additionally, the researchers did not characterise the chemical nature of the oxidants found.

However, the findings do raise concerns about the unregulated or improper disposal, storage and recycling of reusable and non-reusable ENDS components. Within the European Union, the Directive 2006/66/EC on the management of waste batteries and accumulators obliges Member States to ensure that in 2016, the level of collection of portable batteries is 45%.

Likewise, the Directive 2012/19/EU requires Member States to adopt appropriate measures to minimise the disposal of waste electric and electronic equipment in the form of unsorted municipal waste and to achieve a level of collection of 45% in 2016. Both Directives contribute to diminishing, although not avoiding, the risks for the environment entailed by the use of e-cigarettes.

8 May 2015  
Issue 413

[Subscribe](#) to free  
weekly News Alert

**Source:** Lerner, C. A., Sundar, I. K., Watson, R. M., Elder, A., Jones, R., Done, D., Kurtzman, R., Ossip, D. J., Robinson, R., McIntosh, S. & Rahman, I. (2015). Environmental health hazards of e-cigarettes and their components: Oxidants and copper in e-cigarette aerosols. *Environmental Pollution*, 198, 100–107. DOI:10.1016/j.envpol.2014.12.033.

**Contact:**  
[irfan\\_rahman@urmc.rochester.edu](mailto:irfan_rahman@urmc.rochester.edu)

**Read more about:**  
[Chemicals](#), [Waste](#)

The contents and views included in Science for Environment Policy are based on independent, peer-reviewed research and do not necessarily reflect the position of the European Commission.

To cite this article/service: "[Science for Environment Policy](#)": European Commission DG Environment News Alert Service, edited by SCU, The University of the West of England, Bristol.

