

# E-cigarettes are good or bad depending on the study – so what's the truth?

October 22 2018, by Sarah Mitchell, Martin Clift And Shareen Doak

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Credit: AI-generated image ([disclaimer](#))

The number of adults currently using e-cigarettes in the UK is [close to 2.9m](#), many of whom will have turned to the devices to quit smoking. While certainly they may help people kick the habit, there is a big problem with e-cigarettes: we don't actually know for certain whether they are safe or not.

E-cigarettes were originally designed as an alternative to, and an aid for quitting, [tobacco cigarettes](#). They aim to deliver nicotine effectively in a safer, albeit similar, manner. They are thought to contain [far fewer toxic ingredients](#) than their tobacco counterparts – tobacco cigarette smoke [contains thousands of chemicals](#), up to 81 of which are considered cancerous in humans.

They come in multiple shapes and sizes, but all have the same underlying set up. E-cigarettes work by using a battery-powered heating element to heat up a liquid until it turns into a vapour, which the user then inhales. The liquids are made of mostly [propylene glycol](#) and glycerol, in addition to nicotine in different concentrations, and potentially very complex mixtures of flavouring chemicals.

While e-cigarettes gained a fast following, the number of [people](#) using them is actually no longer increasing. This is thought to be down to changing public opinions. In 2017, [26% of people](#) believed that e-cigarettes were just as harmful as tobacco cigarettes, compared to just 7% in 2013. This increase in the number of people thinking that e-cigarettes are harmful could be because contradicting evidence has been reported [both for](#) and [against their use](#). But what's the truth? Are they a useful tool to aid people to stop smoking, or are they just as bad as – or even worse than – tobacco cigarettes?

To best answer this question, we must fully understand what chemicals people are being exposed to and in what quantities when they use e-cigarettes, and whether this poses a risk to health. The key elements of e-cigarettes which may be toxic include the flavourings and other ingredients in the flavoured syrups, nicotine and particles generated from the hardware of the e-cigarette itself.

To generate this data, reliable tests that closely resemble what happens when someone uses an e-cigarette are needed. Researchers have been

assessing these different elements, but again with conflicting results. [One team](#) isolated the main ingredients used in e-cigarette flavour liquids:: propylene glycol, glycerin and nicotine. They then exposed rats to an aerosolised liquid with these components in over 90 days. The rats were exposed to above average concentrations than that of a normal e-cigarette user, but no toxicity or changes to their overall health were found.



Credit: Andrea Piacquadio from Pexels

However, [another research group](#) employed a non-animal approach, using macrophages – a type of immune cell – to test if e-cigarette liquids

cause the onset of inflammation, or any changes in the macrophages' normal function (to help clear the airways of particles or toxins). They exposed the cells to the e-cigarette liquid directly, as well as to a vapourised version, and discovered that the vapourised liquid was more toxic than the raw material, and may cause inflammation. In humans, inflammation in the lungs could lead to diseases such as [chronic obstructive pulmonary disease](#) (COPD).

These are just two example studies, and there are many more that show conflicting evidence. Clearly, more research needs to be conducted to understand the potential [human health](#) hazards generated by e-cigarettes.

While they may not contain the cancer-causing components found in traditional cigarettes, the flavoured liquids may have ingredients that have been previously overlooked since they were approved for use in foods, or have been exposed in other ways to the human body. It is dangerous to assume that because an ingredient has been used in food, for example, it is suitable for vapourisation – people are exposed through a different route, which could mean it affects the body in a different way.

We need to start looking at the gaps in previous data, and analyse all components individually. Only then can we combine them to pinpoint any sources of toxicity in e-cigarettes. Scientists together with companies that manufacture e-cigarette products need to improve the way that they test the hardware and fluid. Real-life scenarios that show how lungs would be affected are best – such as applying the e-cigarette liquid as a vapour, and exposing cells in a manner which mimics normal day-to-day [e-cigarette](#) use, with relevant concentrations of flavourings and nicotine. That being said, these methods cannot show information about long-term effects.

Overall, e-cigarettes should be assessed with their risk to benefit ratio in

mind. If a smoker wishes to quit smoking, and needs a [nicotine replacement therapy](#), e-cigarettes [have been suggested](#) as an effective way to help, reducing human exposure to cancer-causing chemicals found in cigarettes – even though this and other risks are not currently fully understood.

For now, any member of the public looking for information on the safety of e-cigarettes should take news reports, government statements and influencing group claims with a certain pinch of salt. The market continues to expand faster than scientists can determine the true significance of the products to human health. The truth is, there is no clear answer as of yet to the question of whether or not e-cigarettes are good or bad for you.

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Citation: E-cigarettes are good or bad depending on the study – so what's the truth? (2018, October 22) retrieved 19 April 2024 from <https://medicalxpress.com/news/2018-10-e-cigarettes-good-bad-truth.html>

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