

Study finds hazardous chemicals in e-cigarette vapor on top of nicotine and flavorings

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Portland State University researchers have found potentially hazardous chemical compounds in the basic liquid used in e-cigarettes. These

chemicals are in addition to the ones found in an e-cigarette's nicotine and flavorings.

The findings by PSU researchers David Peyton, Rob Strongin and R. Paul Jensen were released this week in *Scientific Reports*, a journal published by Nature Publishing Group.

The PSU research team discovered 15 chemicals by vaporizing the two most common solvents used in e-cigarette liquid—propylene glycol and glycerol – and then analyzing the chemicals that were produced. The results showed the presence of compounds that included toxic chemicals such as acrolein, allyl alcohol and glycidol. The 15 compounds make up the most complete chemical profile ever documented about an e-cigarette's liquid.

Peyton said the chemicals came from the liquid solvents, which serve as the vehicle for delivering nicotine, flavorings and other additives. The researchers did not test those other additives of e-cigarette [liquid](#), which likely would produce additional chemicals not mentioned in the study.

"Our work paves the way for other scientists to study the negative effects of those chemicals," he said. "Over time, these chemicals are going to tell us a lot about the risks of using e-cigarettes."

E-cigarettes have been marketed as a safer alternative to conventional cigarettes since they emerged about 10 years ago. But they're somewhat difficult to study, Peyton said, because of constant changes in the devices themselves and the liquids used in them. There are also inconsistent research methods from one lab to another.

This latest PSU study is part of a series of e-cigarette studies produced by Portland State. In 2015, Peyton, Strongin, Jensen, and Jim Pankow (also of Portland State) published an article the *New England Journal of*

Medicine revealing that e-cigarette vapor can contain formaldehyde at levels five to 15 times higher than regular cigarettes.

For the *Scientific Reports* article, the researchers used [nuclear magnetic resonance](#) (NMR) spectroscopy, a technique that analyzes the physical and [chemical](#) properties of atoms and molecules.

"It uses expensive equipment that you sometimes don't see in chemistry labs," Peyton says. "It's not a method that's routinely used for quantitative analytical chemistry, but it is quite sensitive and very reliable."

More information: R. Paul Jensen et al. Solvent Chemistry in the Electronic Cigarette Reaction Vessel, *Scientific Reports* (2017). [DOI: 10.1038/srep42549](#)

Provided by Portland State University

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