

E-cigarettes with a cigarette-like level of nicotine are effective in reducing smoking

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E-cigarettes that deliver a cigarette-like amount of nicotine are associated with reduced smoking and reduced exposure to the major tobacco-related pulmonary carcinogen, NNAL, even with concurrent smoking, according to a new study led by researchers at Virginia Commonwealth University and Penn State College of Medicine in Hershey, Pennsylvania.

The study, which will be published in *The Lancet Respiratory Medicine* journal, provides new and important information for smokers who may be trying to use e-cigarettes as a means to cut down on their smoking habit and lower their exposure to harmful toxicants.

"[We found] e-cigarettes with [nicotine delivery](#) like a combustible cigarette were effective in helping reduce smoking and exposure to a tobacco-related carcinogen," said lead author Caroline O. Cobb, Ph.D., an associate professor in the VCU Department of Psychology in the College of Humanities and Sciences. "But it doesn't just happen by accident. It requires the smoker to be actively trying to reduce their smoking by replacing

it with [e-cigarette](#) use."

The researchers conducted a randomized controlled trial of 520 participants who smoked more than nine cigarettes a day, were not currently using an e-cigarette device, and were interested in reducing smoking but not quitting.

Over 24 weeks, participants used an e-cigarette device filled with either 0, 8 or 36 milligrams per milliliter of liquid nicotine or a plastic tube (shaped like a cigarette) that delivered no nicotine or aerosol. The e-cigarette conditions were chosen to reflect a range of nicotine delivery, either none, low (8 mg/ml) or cigarette-like (36 mg/ml). The participants were also provided with smoking reduction instructions.

At weeks 0, 4, 12 and 24, the researchers sampled participants' urine, testing for the tobacco-specific carcinogen 4-(methylnitrosamino)-1-(3-pyridyl)-1-butanol, also known as NNAL. They found that participants using e-cigarettes filled with the cigarette-like level of liquid nicotine had significantly lower levels of NNAL at week 24 compared to baseline and compared to levels observed in the non-e-cigarette control condition.

The findings represent an important addition to the scientific literature because it suggests that when e-cigarettes deliver nicotine effectively, smokers have greater success in reducing their smoking and tobacco-related toxicant exposure. This study is important for two reasons, Cobb said.

"First, many e-cigarettes have poor nicotine delivery profiles, and our results suggest that those products may be less effective in helping smokers change their behavior and associated toxicant exposure," she said.

"Second, previous randomized controlled trials examining if e-cigarettes help smokers change their

smoking behavior/toxicant exposure have used e-cigarettes with low or unknown nicotine delivery profiles," she said. "Our study highlights the importance of characterizing the e-cigarette nicotine delivery profile before conducting a [randomized controlled trial](#). This work also has other important strengths over previous studies including the sample size, length of intervention, multiple toxicant exposure measures and control conditions."

Provided by Virginia Commonwealth University

The question of whether an e-cigarette's nicotine delivery profile is predictive of its ability to reduce harm and promote [behavior change](#) among smokers remains highly relevant to policymakers, public health advocates, health care providers and smoking populations. That knowledge will lead to better designed studies of the potential harms and benefits of e-cigarettes and ultimately inform tobacco regulatory policy, Cobb said.

The study contributes to the ongoing question of what role e-cigarettes play in changing smoking behavior.

Jonathan Foulds, Ph.D., professor of public health sciences at Penn State (one of the two study sites), commented, "This study shows that when smokers interested in reduction are provided with an e-cigarette with cigarette-like [nicotine](#) delivery, they are more likely to achieve significant decreases in tobacco-related toxicants, such as lower exhaled carbon monoxide levels."

Additionally, the study's findings support limited safety concerns for the use of the specific e-cigarette/liquid combinations over the short term, even in the context of concurrent cigarette [smoking](#). However, Cobb added, very little is known about the effects of e-cigarettes over the course of years, as opposed to the study's 24-week period.

More information: "Effect of an Electronic Nicotine Delivery System with 0, 8, or 36 mg/ml Liquid Nicotine Versus a Cigarette Substitute on Tobacco-Related Toxicant Exposure: a Randomised Controlled Trial," *The Lancet Respiratory Medicine*, 2021.

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