

E-Cigarettes as Safe as Nicotine Replacement in Real-World Study

Pam Harrison | February 07, 2017

Former smokers who only use e-cigarettes or nicotine replacement therapy (NRT) are substantially less likely to be exposed to carcinogens and toxins than those who continue to smoke, a cross-sectional study indicates.

Furthermore, the data show no evidence that former smokers who use e-cigarettes exclusively are exposed to greater levels of carcinogens or toxins than those who only use NRT, suggesting e-cigarettes are comparable to NRT in terms of long-term safety.

"To our knowledge, this is the first direct comparison of the metabolite levels of nicotine and important carcinogens and toxins in long-term e-cigarette or NRT users," Lion Shahab, PhD, senior lecturer in health psychology at the University College London, United Kingdom, and colleagues write. "We found that ... [l]ong-term NRT-only use and especially e-cigarette-only use, but not dual use of NRTs or e-cigarettes with combustible cigarettes, were associated with lower levels of known tobacco-related carcinogens and toxins measured in this study compared with combustible cigarette-only use," they add.

The study was [published online](#) February 7 in the *Annals of Internal Medicine*.

Investigators separated study participants into five different groups: smokers who smoked cigarettes only (referred to as combustible cigarette-only users), former smokers who had used either e-cigarettes or NRT for at least 6 months, and those who continued to smoke but who also used either e-cigarettes or NRT (dual users). All groups included 36 participants, with the exception of the smoking-only group which included 37 individuals. The type of e-cigarette varied among those who used them, the investigators note.

The researchers analyzed urine and saliva samples for biomarkers of nicotine: tobacco-specific N-nitrosamines (TSNAs), including the established carcinogen 4-(methylnitrosamino)-1-(3-pyridyl)-1 butanol, or NNAL, and a number of different metabolites of volatile organic compounds (VOCs). Both TSNAs and VOCs are well-known to contribute to cigarette-related carcinogenic risk.

"The NRT-only and e-cigarette-only users had markedly lower NNAL levels than combustible cigarette-only, dual combustible cigarette-NRT, and dual combustible cigarette-e-cigarette users ($P < 0.001$)," Dr Shahab and colleagues report.

Indeed, former smokers who only used e-cigarette had 97% lower NNAL levels compared with NNAL levels detected in smokers. "Results followed a similar, albeit less pronounced, pattern for the other TSNAs measured," they add.

Similarly, investigators found that former smokers who used e-cigarettes exclusively had the lowest levels of major urinary VOC metabolites, followed by NRT-only users, who had the second lowest levels out of the five groups analyzed ($P < .001$).

"By contrast, dual combustible cigarette-NRT, dual combustible cigarette-e-cigarette and combustible cigarette-only users all had very similar urinary VOC metabolite levels," the authors write.

Interestingly, levels of total nicotine as detected in the urine among users of all products were roughly similar to those detected in smokers in the adjusted analysis. "[This observation] supports the view that users seek a particular level of nicotine intake, regardless of the delivery system, and adjust product use accordingly," as the investigators suggest.

Low Levels

Commenting further on their findings, Dr Shahab and colleagues point out that the low levels of carcinogens and toxins detected in exclusive e-cigarette and NRT users simply consolidate previous reports that long-term NRT use is safe.

They also suggest that the dramatically lower levels of carcinogens and toxins seen in association with e-liquids and aerosols should allay concerns that long-term e-cigarette exposure is harmful.

"Given the involvement of these TSNAs and VOCs with cancer, cardiovascular diseases, and pulmonary diseases, our results suggest that complete substitution of combustible cigarettes with e-cigarettes may reduce disease risk and support the assertion that e-cigarette use may be less harmful than smoking," they conclude.

Allay Concerns

Asked by *Medscape Medical News* whether the current study should allay concerns that e-cigarettes are harmful, David Nutt, MD, PhD, professor of medicine at the Imperial College London, United Kingdom, who was not involved in the study, said it does.

"I have to say these findings are completely [unsurprising], because we knew from what was in these e-cigarettes that they couldn't be as harmful as has been previously claimed," Dr Nutt said. "And this is a study that just shows that in the real world, people who said e-cigarettes were safer [than smoking] were right: you have to be crazy to think that e-cigarettes could produce the same toxins as tobacco," he added.

Dr Nutt also emphasized that previous reports linking toxic effects from vaping were not done using appropriate controls, which in this case should have been smoking.

"When you do the controls with smoking, as this study did, you show that e-cigarettes are massively safer than smoking, as we would have predicted," Dr Nutt emphasized.

Dr Shahab reports receiving grants from Cancer Research UK as well as grants from Pfizer to study smoking cessation. He also reports receiving personal fees from Atlantis Health Care. Dr Nutt declares that he serves as an advisor to Lundbeck, MSD, Nalparm, Orexigen, Shire, MSD, Opiant, and Sunovion and has received additional honoraria from BMS/Otsuka, GSK, Lilly, Janssen, Servier, AZ, and Pfizer. Dr Nutt also has received grants from P1vital, MRC, NHS, and Lundbeck, and has share options in P1vital. He is also director for Equasy Enterprises and Greenlight.

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