

## E-Cigarettes Are Less Dangerous Than Cigarettes but Not Entirely Safe

Studying the safety of electronic cigarettes (e-cigarettes) on teenagers is extremely important. Rubinstein et al<sup>1</sup> describes the presence of certain metabolites in the urine of adolescents who smoke e-cigarettes. They also tell us many of them are carcinogenic. They conclude by advising the public to warn teenagers about “the potential risk from toxic exposure to carcinogenic compounds.” However, they fail to adequately frame the message for cigarette smokers:

1. Authors were careful to select e-cigarette-only users (they even established their eligibility by measuring the levels of urine NNAL), but they did not recruit a comparison group composed of cigarette-only users. Being able to compare both groups is important because e-cigarettes are advertised as an alternative to cigarettes (the carcinogenic hazards of cigarette consumption are well established), not as an alternative to dual use. Having measured the levels of volatile organic compounds (VOCs) in cigarette-only users, we would know by how much e-cigarettes reduce the levels of VOCs compared with cigarettes in teenagers. The authors cited a study in which this design was used,<sup>2</sup> suggesting they deliberately decided not to have such comparison group.
2. The authors do not tell the reader the levels at which these VOCs start being toxic. This information is crucial to understand the importance of the findings. Although a statistical analysis is useful, toxicity can be better assessed by using a population-level measure of toxicity. If such information is not yet available, it should be mentioned.

Even in the absence of these data, we know that a reduced intake of VOCs is

associated with a reduction of disease risk.<sup>3</sup> It is likely that cigarette smokers would benefit by becoming e-cigarette-only users, and this should be emphasized given how lightly scientific articles can be interpreted and how prevalent smoking-related cancer is.

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### REFERENCES

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### Author Response

We appreciate the interest our research has garnered. No single study can resolve all questions of interest, and all findings warrant replication. Our focus for this study was examining toxicants in adolescent e-cigarette-only users relative to nonusers. Because a number of adolescents who enrolled in our study were found to also have recently smoked combustible cigarettes (dual users), we included them as a comparison group.

As we stated in our article,<sup>1</sup> e-cigarettes do appear to produce lower levels of toxicants than traditional cigarettes based on the literature and on the

levels observed among our dual user group. Use of e-cigarettes among adult tobacco smokers was not a focus of our study, and we encourage readers interested in that literature to see the references we noted in our article. Again, we chose to focus on adolescents for whom the paradigm is different than the debate that has been characterized as harm reduction among adults. Rather, the focus of interest with adolescents is harm creation. The comparison of interest is not combustibles, but no use of any tobacco product at all. Specifically, adolescents are by and large using e-cigarettes for recreational use, not as a means of switching from traditional cigarettes. This is evidenced by epidemiological data revealing that the number of adolescents using e-cigarettes outnumbers adolescent tobacco smokers (in the United States), and use by never-smokers is also increasing. Furthermore, studies of adolescents in the United States reveal a reverse trajectory for teenagers from e-cigarettes to traditional cigarettes. Consequently, for adolescents, the question of interest is as follows: are these products more dangerous than no use at all (rather than compared with tobacco-only smoking)? As such, the most relevant groups for comparison would be those with and without e-cigarette exposure, which was the focus of our study.

The relative toxicity of the products is complex to determine. For this reason, we analyzed exposures in a non-e-cigarette using comparison group. That way, readers can compare baseline environmental exposures, which we point out in the article were greater than zero. Again, with the perspective that most adolescents are using e-cigarettes for recreational purposes, our findings provide a warning that they are exposing themselves unnecessarily to cancer-causing toxicants. As we point out in the article (and consistent with other exposures such as secondhand tobacco smoke), the harm from these