



The Unknowns of Vaping: Oxidative Stress, Toxicity, and DNA Damage Across the Device Lifetime

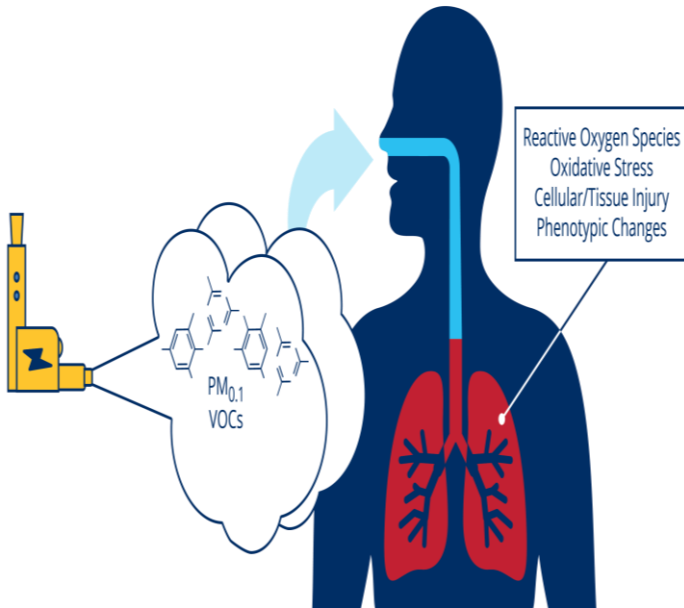
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Background on Vaping Epidemic: What do we know so far?

- In the U.S., approximately 21% of adult smokers and 19.6% of high school students have reported ever having used ENDS. (Varlet et al., 2015) (CDC, 2020)
- Vaping topography studies, which evaluate how ENDS users utilize these products, indicates vaping is significantly different than traditional smoking. (Guerrero-Cignarella et al 2018)
- Despite evidence of the differential rate of exposure imposed by vaping, only a limited number of studies have addressed how variances in user vaping behavior, device format and vaping frequency may influence respiratory health. (Son et al 2020)

Evaluating Vaping Patterns and Exposure Risks

Exposure Pathway of E-cigarettes and Potential Respiratory Outcomes



- There is a gap within our understanding of how consumer usage plays a role in ENDS-induced respiratory injury.
- Preliminary studies indicate certain patterns of usage may enhance the release of metal particles into ENDS aerosols. (Pearce et al 2020)
- New evidence suggests that while vaping produces lower levels of VOCs, continual vaping or grazing may increase chemical exposure risks. (Kosmider et al 2014)

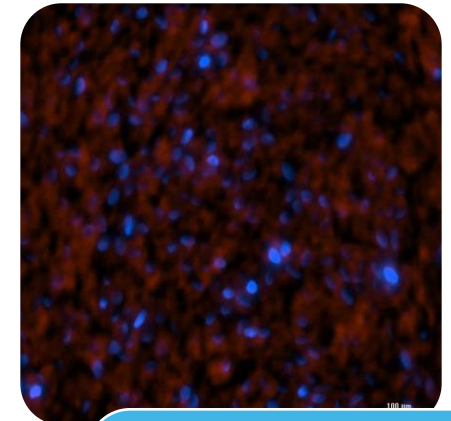
Hypothesis: Regular use of ENDS can lead to oxidative stress/inflammation resulting in DNA damage due to an increase of hazardous chemical components as the device ages.

Experimental Aims and Methods Overview

Aim 1. Establish an automated ENDS puffing and aerosol sampling system

Aim 2. Develop extraction protocol to test the toxicity of collected puff fractions

Aim 3. Utilize SAEC to determine the tox profiles of each puff fraction



ENDS aerosol generation

- Custom built 4-channel puffing machine
- CORESTA 81 method
- Buffer/ageing chamber

Aerosol and VOC sample collection

- FEP (Fluorinated ethylene-propylene) tube
- Absorbent tubes
- Weighing tubes and e-liquids

Sample extraction

- MeOH (75%)
- Water-bath sonicator
- Vacufuge

Toxicological Characterization

- SAEC
- Oxidative stress
- Cellular viability
- DNA damage

Conclusions

- Continuous use of the same ENDS over extended periods of time causes moderate levels of toxicity and significant declines in glutathione leading to oxidative stress.
- Significant increases in DNA damage were shown due to older aerosol exposures indicating that prolonged usage may elicit genotoxicity that may cause pathological changes if not repaired.
- Toxicological outcomes may be related to differences in level/species of toxic VOCs found in each puff fraction.
- These studies warrant further investigation into specific ENDS usage patterns to determine any associated pathophysiological consequences.

Thank you

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