



The Effect of Pod-based E-Cigarettes on Endothelial Cell Phenotype: Preliminary Results

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INTRODUCTION

- » More than 25% of high-school students use e-cigarettes
- » Many youth perceive e-cigarettes to be safer than conventional cigarettes
- » Pod-based devices produced by JUUL account for >70% of the total market share
- » A recent study in rats reported that JUUL induced endothelial dysfunction
- » The effects of JUUL aerosol and e-liquid components on human endothelial cells remain unknown

OBJECTIVE

To evaluate the effects of JUUL e-liquid components on vascular endothelial cell function

METHODS

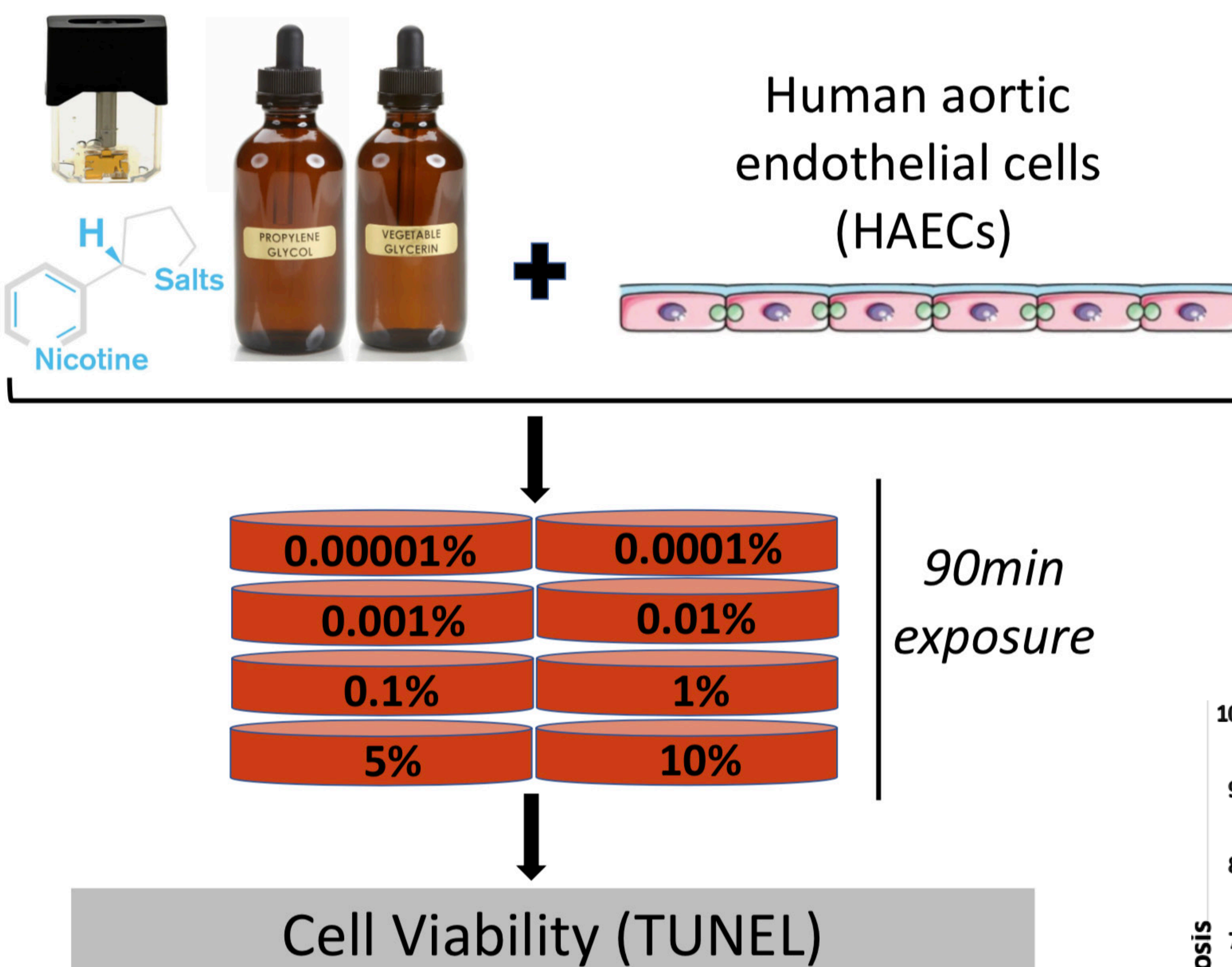


Figure 1: Schematic depicting experimental design. The JUUL pod e-liquid consists of a propylene glycol (PG) and vegetable glycerin (VG) vehicle at a 30:70 ratio, nicotine salt, and flavoring.

- » System: Human aortic endothelial cells in culture
- » Exposure: JUUL e-liquid components in serial dilutions
- » Outcome Measures: Cell viability with TUNEL assay



RESULTS

- » Higher dilutions of JUUL e-liquids, nicotine salt, and PG/VG vehicle induced significant cell death
- » Notably, evidence of increased cellular toxicity was seen even at the lowest dilutions ($<1\%$)
- » No overt differences in cytotoxic effects across the individual JUUL liquid flavors
- » Toxicity induced by nicotine salt or PG/VG alone was similar to that of entire JUUL e-liquid

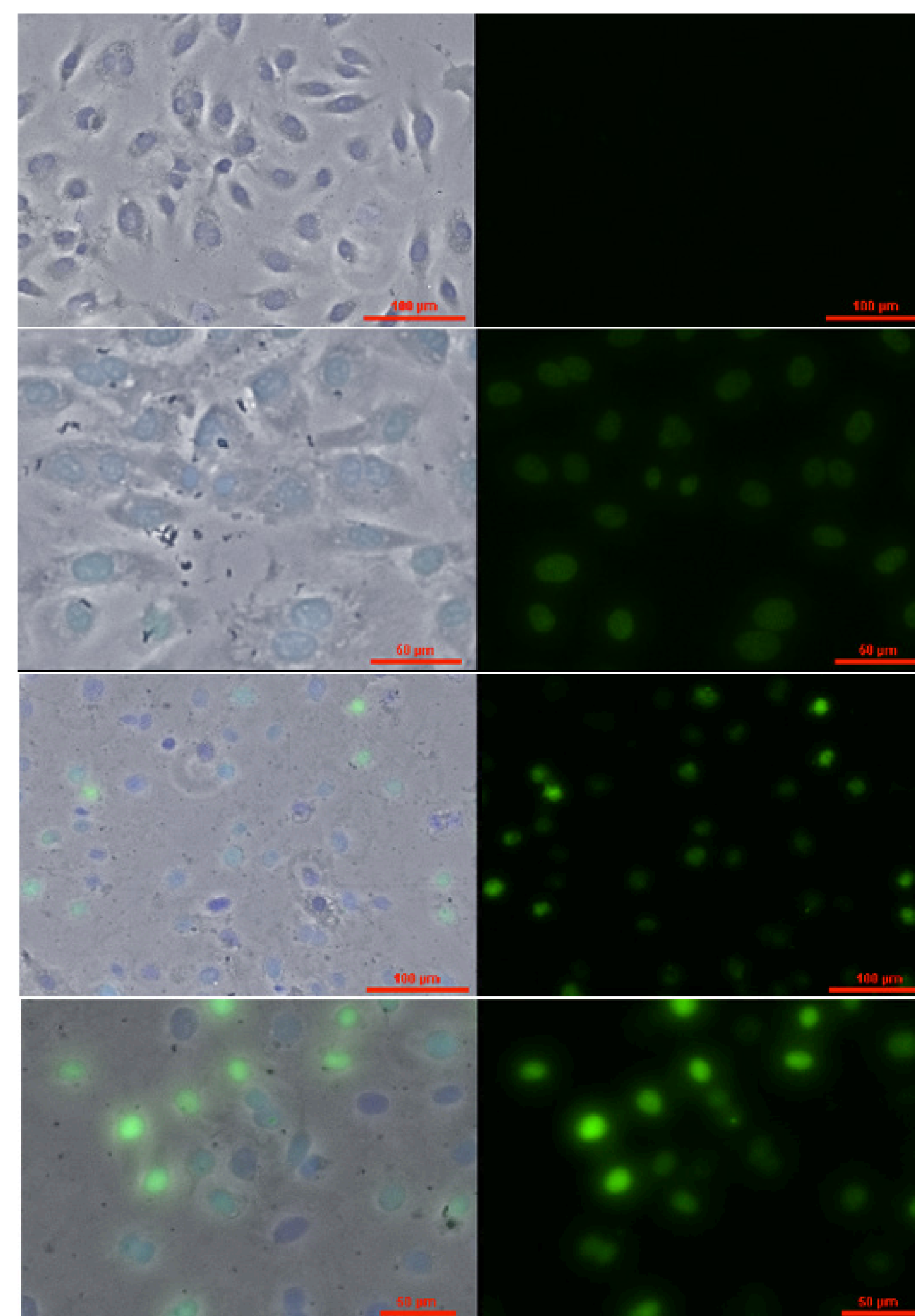


Figure 2A: Negative control (no flavor, no nicotine).

Figure 2B: Positive control (DNase I). 100% apoptosis seen.

Figure 2C: Menthol at 0.01% dilution.

Figure 2D: Virginia Tobacco at 0.1% dilution.

Raw imaging data. Left side of each image represents a combination of brightfield microscopy, fluorescein (green), and DAPI (blue). Right side of each image shows only fluorescein.

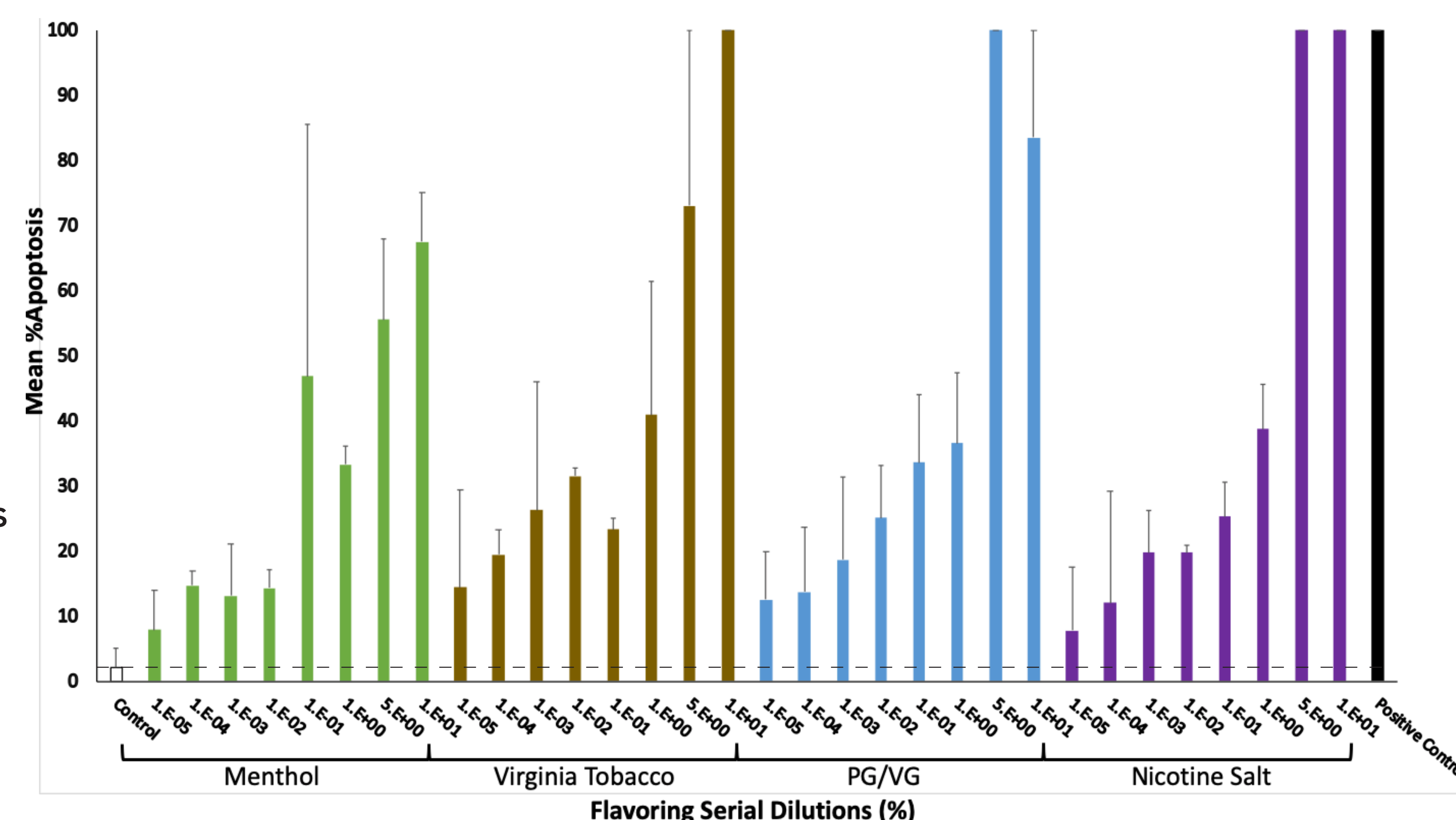


Figure 3: Dose-dependent response of various JUUL liquids compared to vehicle-only and nicotine-salt only controls on %apoptosis. $n=2$ replicates for Menthol, Virginia Tobacco. $n=3$ replicates for PG/VG, nicotine salt.

CONCLUSIONS

- » JUUL e-liquid components demonstrated acute toxicity in vascular endothelial cells
- » In future studies, we plan to expose endothelial cells to JUUL aerosols (evaluating for transcriptomics and oxidative stress)

FUTURE DIRECTIONS

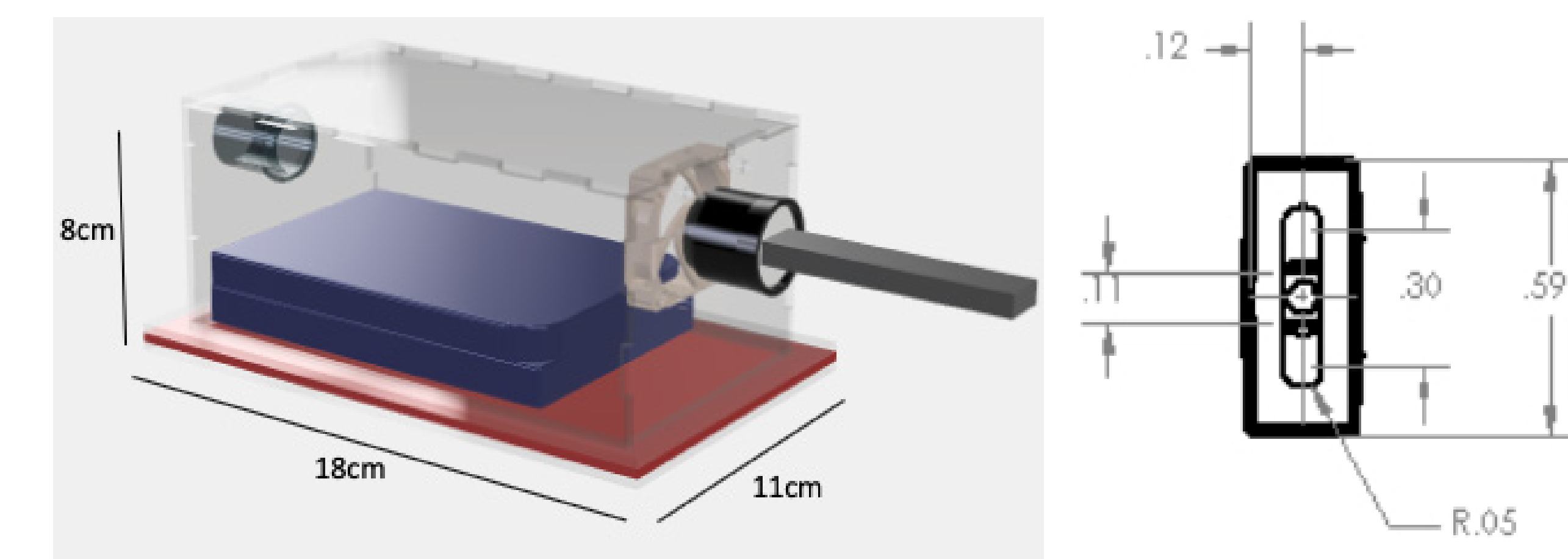


Figure 4: JUUL-aerosol exposure chamber (left); SolidWorks CAD drawing (right).



Figure 5: Final 3D-printed conduit device for use with VitroCell VC10 Smoking Robot. Heat stable resin with a 0.09mm midline channel for JUUL vapor.

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