Impact of nicotine salts on pulmonary damage using in vitro and in vivo models

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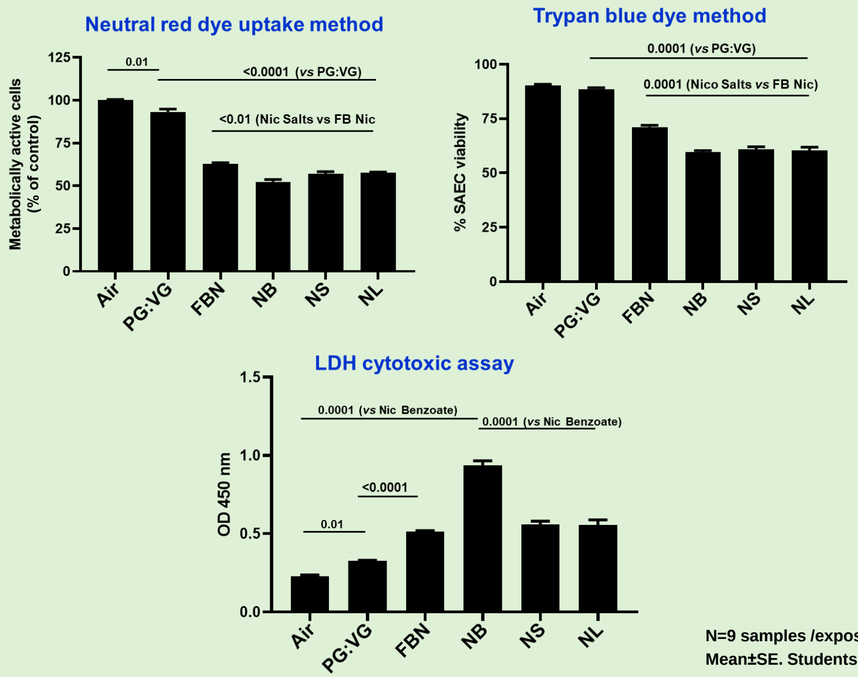
Introduction

- Electronic nicotine delivery systems (ENDS), popularly called electronic cigarettes (ECs) represent a significant and increasing proportion of tobacco consumption in the United States.
- Pods, the newest generation of ECs which hold a salt solution of highly concentrated nicotine, have soared in popularity; most notably, one brand, Juul.
- Nicotine salts like nicotine benzoate, salicylate and levulinate contained in Juul are believed to increase the amount and rate of nicotine uptake in pod users, effectively increasing the dose of nicotine delivered to the user.
- However, the impact of aerosols from nicotine salts on pulmonary microenvironment is not known.

Hypothesis

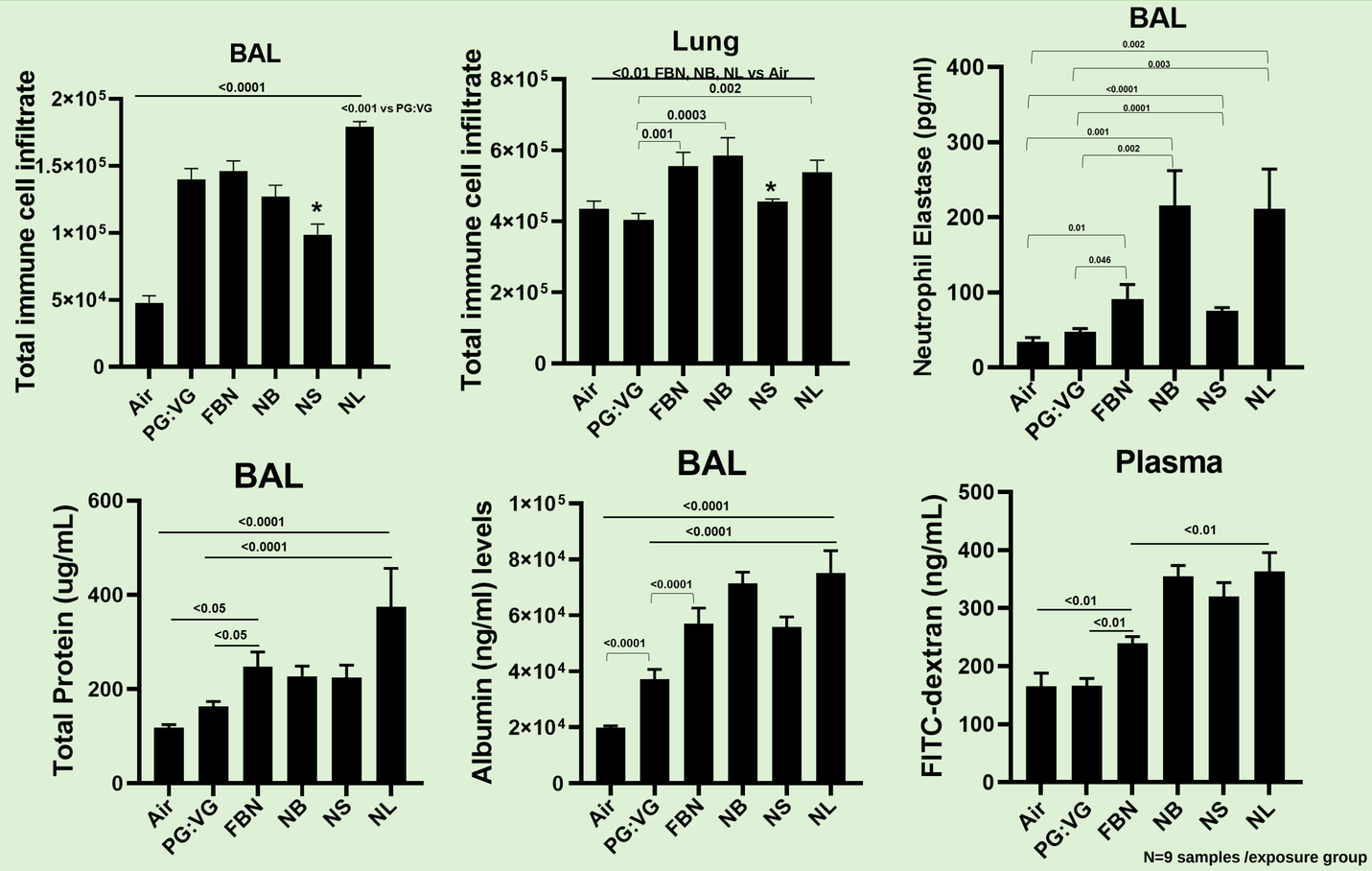
- Inhalatory exposure to Juul aerosols containing various nicotine salts impacts pulmonary microenvironment to cause lung damage

Nicotine-containing Juul aerosols are toxic to primary human small airway epithelial cells (SAEC) *in vitro*



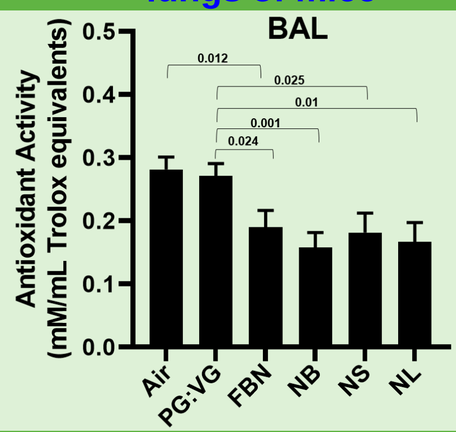
N=9 samples /exposure group
Mean±SE. Students t=test.

Nicotine salt aerosols induce a proinflammatory pulmonary microenvironment and cause a significant lung damage in a mouse model of acute-inhalation exposure



N=9 samples /exposure group
Mean±SE. Students t=test.

Acute exposure to nicotine-salt aerosols decreases the anti-oxidant potential in the lungs of mice



Conclusions

- Nicotine salt-containing EC aerosols induce more cytotoxicity in SAEC cells than freebase nicotine.
- Among the nicotine salts under study, nicotine benzoate-aerosols are more toxic to SAEC cells.
- While acute ENDS aerosol-exposures induce lung epithelial-cell damage in mice , aerosols from nicotine salts tend to induce more damage than freebase nicotine.
- Acute ENDS exposures diminish the antioxidant potential in lungs, indicating an increased oxidative stress in mice.

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