PROPYLENE GLYCOL: A BIOMARKER OF EXPOSURE SPECIFIC TO E-CIGARETTE CONSUMPTION

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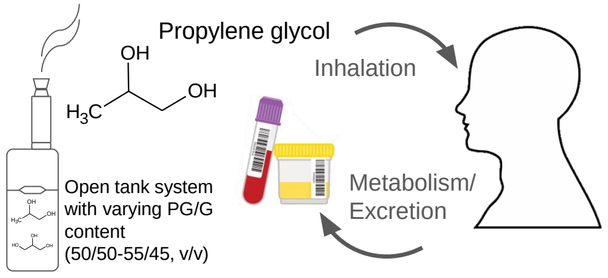
Introduction

For decades, measurement of biomarkers of exposure (BoE) has provided important data for assessing the health risk from cigarette smoking. With the emergence of new tobacco and nicotine-delivery products the tobacco landscape increasingly changed. Especially electronic cigarettes (ECs) are considered as a cessation tool in tobacco harm reduction. This reinforces the need to identify BoE specific to the EC use in order to complement exposure compliance monitoring and risk assessment. Therefore, a sensitive LC-MS/MS method was developed for the quantification of the main e-liquid constituents, propylene glycol (PG) and glycerol (G), in urine and plasma.

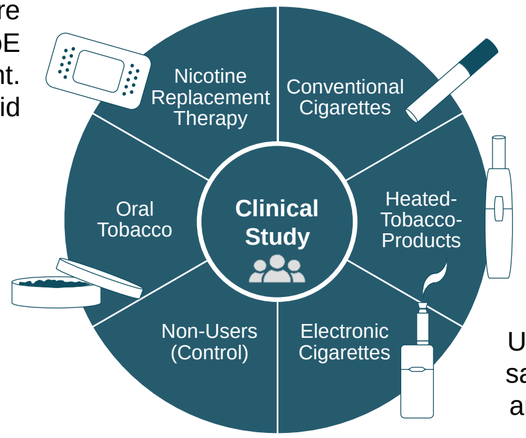
OBJECTIVE

Quantification of PG and G in urine and plasma samples in order to **differentiate** between **e-cigarette users** and other nicotine product user groups and non-users.



Study Design + Experimental

Clinical Study with **5 different nicotine** product user groups and a non-user group (control)



10 subjects per group

3 days of confinement

Urine + plasma samples for PG and G analysis

Sample preparation

Derivatization/Schotten–Baumann reaction

↓

Quenching/Liquid-liquid extraction (LLE)

↓

Evaporation + Reconstitution

↓

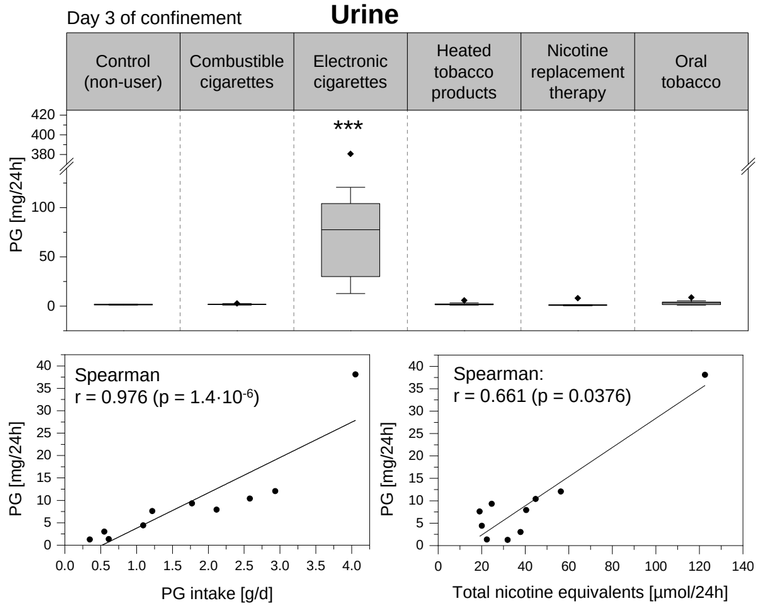
LC-MS/MS Analysis of PG and G

Data evaluation

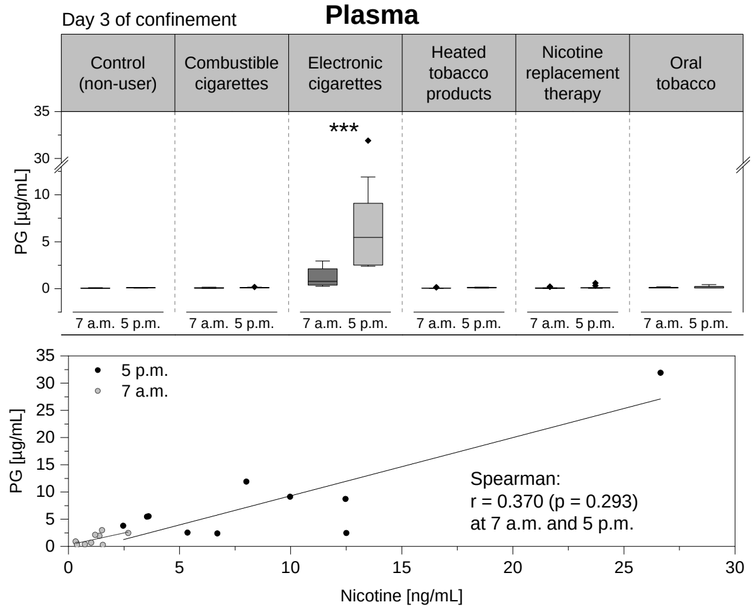
- Urinary levels normalized to 24h urine volume
- Statistical evaluation: Mann-Whitney U test (significance level: $p < 0.01$)

Results and Discussion

Propylene glycol



- Significantly elevated PG levels in EC users compared to other nicotine product user groups & non-users under controlled (3 days of confinement), but also under real-life conditions (directly after admission to the clinic)
- Significant correlation of PG in 24 h urine with PG intake as well as total nicotine equivalents (Nic + 10 metabolites)



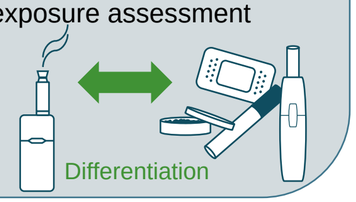
- Significant differences of PG in plasma of EC users compared to other nicotine product user groups & non-users
- Increase in PG plasma concentrations during the day in correlation to e-cigarette use (no use before 8 AM)
- Moderate correlation between nicotine and PG in plasma

Glycerol

- **Urine:** No significant differences in G content of e-cigarette users compared to other nicotine product user groups and non-users ($p > 0.01$, Mann-Whitney U Test, 24 h urine)
- **Plasma:** No significant differences in G content of e-cigarette users compared to other nicotine product user groups and non-users ($p > 0.01$, Mann-Whitney U Test, day 3)

Conclusions

- **Glycerol** is **NO SUITABLE** biomarker to differentiate between EC users and other nicotine user groups and non-users
- **Significant differences in PG levels** (in urine and plasma) of EC users compared to other nicotine product user groups and non-users
- **PG excretion in urine strongly correlated to vaping behavior**
- **Propylene glycol** is a **SUITABLE biomarker** to differentiate EC users from other nicotine product user groups including smokers as well as non-users
- High specificity of PG for EC consumption allows for the use of PG in urine and/or plasma to monitor EC use compliance in exposure assessment
- For more information see Burkhardt et al., 1,2-Propylene Glycol: A Biomarker of Exposure Specific to e-Cigarette Consumption. Separations. 2021; 8(10):180.



This study was funded with a grant from the Foundation for a Smoke-Free World, a US nonprofit 501(c)(3) private foundation with a mission to end smoking in this generation. The Foundation accepts charitable gifts from PMI Global Services Inc. (PMI); under the Foundation's Bylaws and Pledge Agreement with PMI, the Foundation is independent from PMI and the tobacco industry. The contents, selection, and presentation of facts, as well as any opinions expressed herein are the sole responsibility of the authors and under no circumstances shall be regarded as reflecting the positions of the Foundation for a Smoke-Free World, Inc.
The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data.