Effect of Laboratory Conditions on E-cigarette Aerosol Collection

Anthony P. Brown, Karen C. Avery, Michael J. Morton, John H. Miller, Jason W. Flora, Karl A. Wagner

Altria Client Services, 601 East Jackson Street, Richmond, VA 23219

2015_STPOST07_Brown(Flora).pdf

INTRODUCTION

- A standardized atmosphere for conditioning and testing cigarettes has proved necessary to ensure comparability of test results from different laboratories[2]
- FDA has proposed a deeming rule to extend its tobacco product authority for e-cigarettes,[3] but presently there is no standard testing atmosphere for e-cigarette aerosol collection
- In June 2015, CORESTA specified the test atmosphere tolerances for temperature and humidity during e-cigarette aerosol collection; however, the CORESTA recommended method (No. 81) does not state temperature and humidity targets for the test atmosphere[4,5]

OBJECTIVE

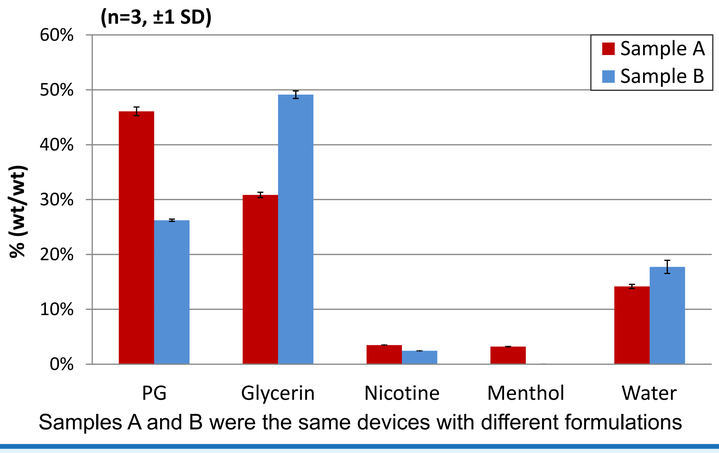
- To investigate the effect of percent relative humidity (%RH) on device mass loss, collected aerosol mass (AM), nicotine, menthol, propylene glycol (PG), glycerin, and water trapped on a conditioned Cambridge filter pad (CFP) from commercial e-cigarettes

METHOD

Testing Conditions

	Testing Conditions
Testing Atmosphere	Temperature 22 ˚C ± 2 °C 40, 60, 85% RH ±5%
Sample Types	Identical rechargeable devices Sample A (menthol) Sample B (non-menthol)
E-cigarette Cartridge Handling	Stored in unopened blister pack under test atmosphere Batteries were charged before testing
Collection	Cerulean Ceti 8 44 mm CFP, conditioned in testing atmosphere >48 h
Aerosol Collection Regime	20 puffs 55 cc square wave puff, 5 sec puff duration, 30 sec puff interval
Analysis	GC-FID for PG, glycerin, menthol, nicotine GC-TCD for water

Formulation Composition

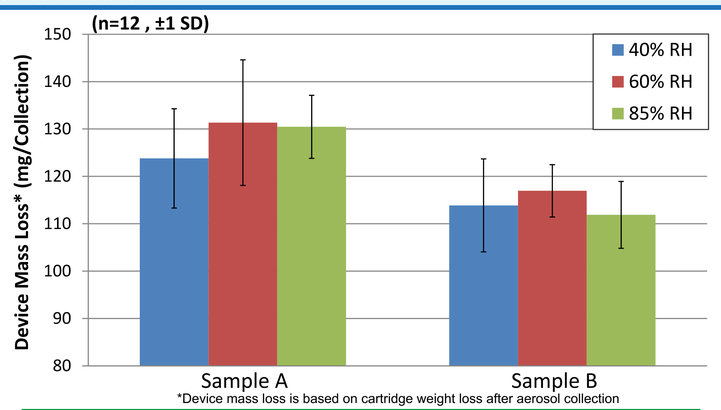


Samples A and B were the same devices with different formulations

ABSTRACT

Smoking machines were first developed to generate smoke from tobacco cigarettes for the purpose of comparing cigarette tar and nicotine yields under consistent conditions. The International Organization for Standardization (ISO) specifies the atmosphere for the conditioning and testing of tobacco products in ISO 3402:1999.[1] Conditioning is required for a minimum of 48 hours at an atmosphere of 22 ±1 °C and 60 ±3% relative humidity (RH). The testing atmosphere requires 22 ±2 °C and 60 ±5% RH. No standardized environmental conditions exist for e-cigarette aerosol collection. Therefore, the purpose of this work was to evaluate the effect of laboratory environmental conditions on the collection of e-cigarette aerosols using a consistent puffing regime. While temperature can typically be controlled in most laboratories, RH cannot. Therefore, RH was the primary focus of this investigation. Commercial e-cigarettes were puffed using a square wave puff profile for 5 seconds, 55 cc puff volume, and 30 second puff interval. Twenty puffs were collected on a conditioned Cambridge filter pad (CFP) and the aerosol collected was evaluated for total aerosol mass (AM), and the concentration of nicotine, menthol, propylene glycol, glycerin, and water using gas chromatography with flame ionization and thermal conductivity detectors. Aerosol collection was conducted at 22 ±2 °C with a %RH of 40, 60, and 85. Differences in analyte concentrations at the various RHs will be discussed.

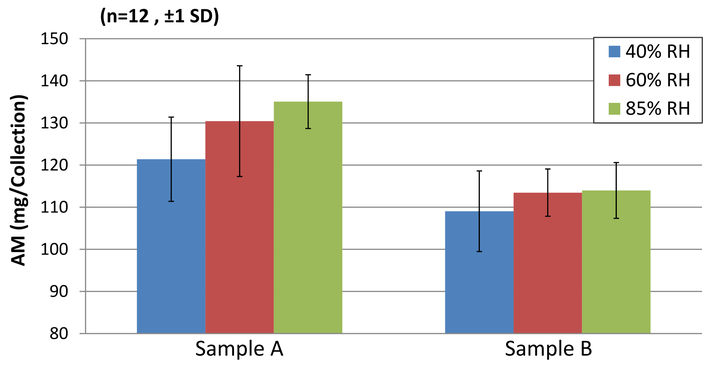
Device Mass Loss



*Device mass loss is based on cartridge weight loss after aerosol collection

There was not a statistically significant trend in device mass loss with %RH

Collected Aerosol Mass

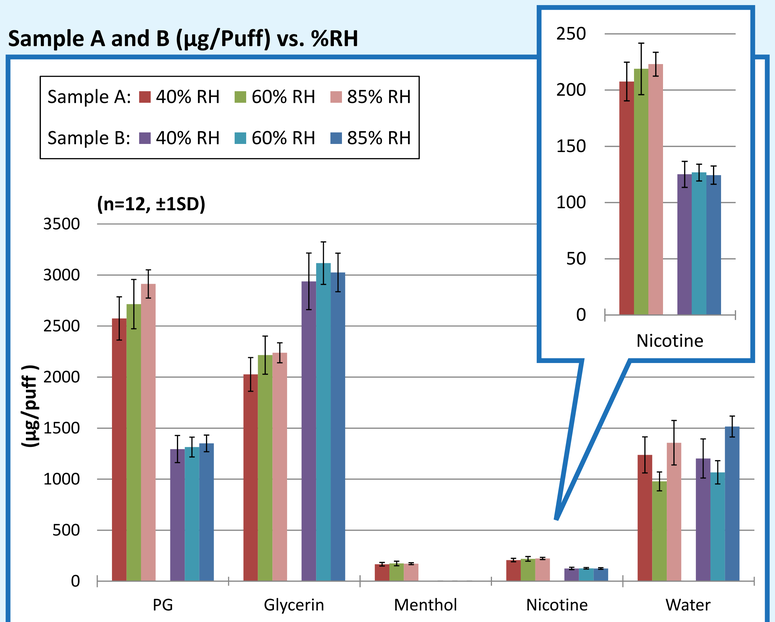


There was a statistically significant trend for collected AM with %RH for Sample A but not for Sample B

This poster may be accessed at www.altria.com/ALCS-Science

RESULTS

Sample A and B (µg/Puff) vs. %RH



PG, glycerin and nicotine show a statistically significant trend with %RH for Sample A but not for Sample B

SUMMARY

- Sample A showed a statistically significant trend with %RH for collected AM and mass/puff for PG, glycerin, and nicotine
- Sample B did not show any statistically significant trends with %RH for the measures made in this study (device mass loss, collected AM, and formulation components)
- Environmental conditions can have a small, but statistically significant effect on collected aerosol components, and this effect appears to be formulation dependent

REFERENCES

1. ISO 3402:1999, Tobacco and tobacco products - Atmosphere for conditioning and testing.
2. CORESTA Recommended Method No. 21. August 1991, Atmosphere for conditioning and testing tobacco and tobacco products.
3. Federal Register, Deeming tobacco products to be subject to the Federal Food, Drug, and Cosmetic Act, as amended by the Family Smoking Prevention and Tobacco Control Act; Regulations on the sale and distribution of tobacco products and required warning statements for tobacco products. FR Doc. 79-23141, April 25, 2014, p. 23141-23207.
4. CORESTA Recommended Method No. 81. June 2015, Routine analytical machine for e-cigarette aerosol generation and collection – Definitions and standard conditions.
5. CORESTA E-cigarette Task Force technical report, 2014 Electronic cigarette aerosol parameters study, March 2015.

SSPT2015 - Document not peer-reviewed by CORESTA