

# Analysis of Third-Hand Exposure of Cannabis and Tobacco Smoke to Cotton and Polyester Fabrics Using SPME-GC×GC-TOFMS

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## Introduction and Objectives

- Third-hand exposure to smoke: exposure to the residual smoke particles and volatile compounds left behind on fabrics and other textile materials.
- Third-hand smoke can carry carcinogens agents (CA), respiratory toxicants (RT), cardiovascular toxicants (CT), reproductive or developmental toxicants (RDT) and/or addictive compounds (AD).
- What compounds from the smoke do cotton and polyester sorb?
- Fabric samples (2cm×2cm samples of both cotton and polyester) were exposed to tobacco and cannabis smoke using a smoke chamber and smoke machine.
- Solid Phase Microextraction Two-Dimensional Gas Chromatography-Time of Flight Mass Spectrometry (SPME-GC×GC-TOFMS) was used to identify and analyze different compounds sorbed by the samples.

## Experimental Methods

### Fabric Samples

2cm x 2cm cotton and polyester

Wash Solution

Samples rinsed x 8

Vortexed for 5 min.

Samples left @65°C until dry

### Smoke Exposure

Smoking Machine

Smoke from tobacco cigarettes and cannabis joints

Puff regime:  
Health Canada Intense  
Puff volume: 55mL  
Puff time: 2s  
Every 30s

### Extraction

Technique: Solid Phase Microextraction (SPME)

Conditions:  
Incubation temp.: 60°C  
Incubation time: 5 min.  
Extraction time: 5 min.  
Desorption temp.: 250°C  
Desorption time: 5 min.

SPME fiber

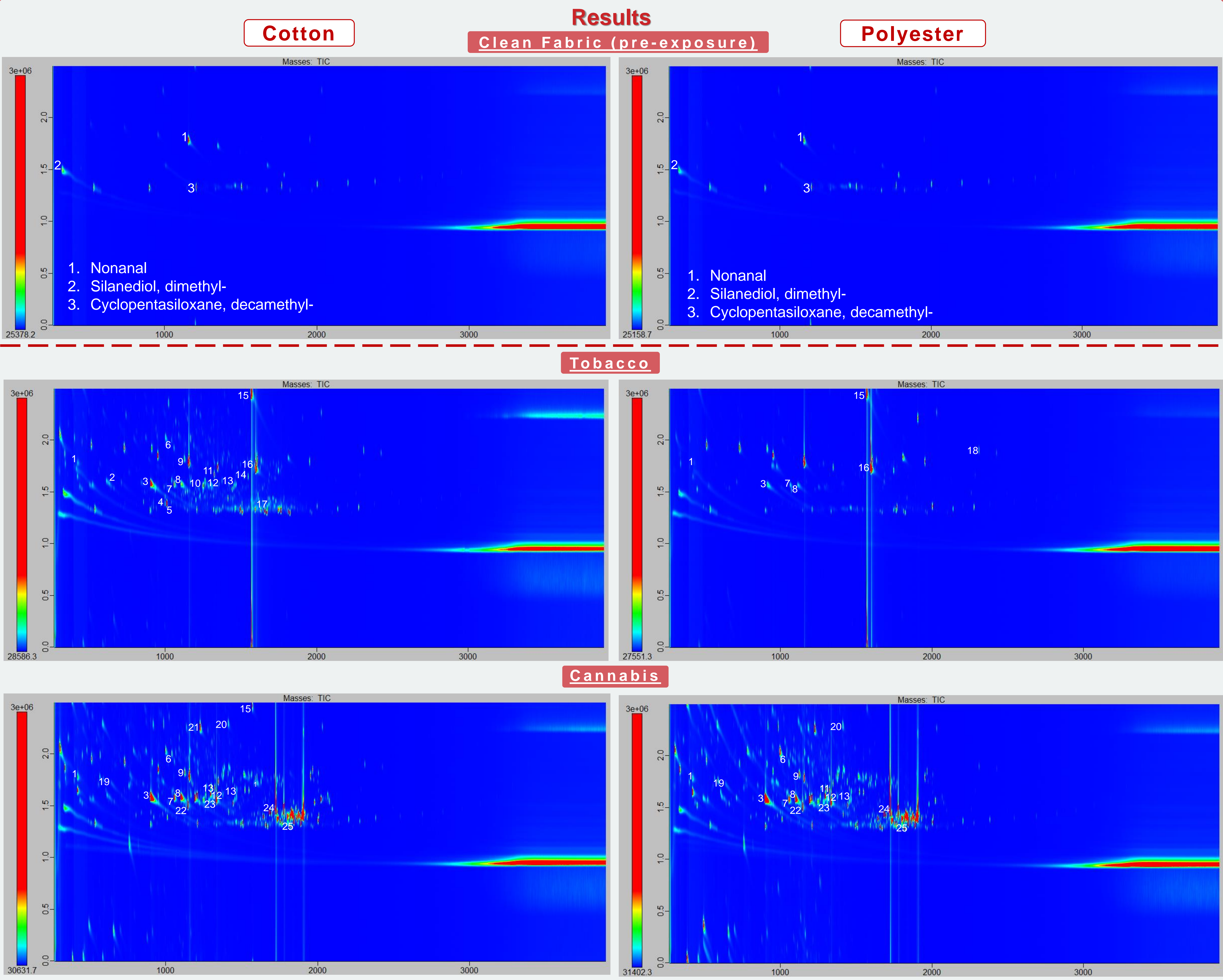
### GC×GC-TOFMS

GC×GC Conditions:

- Column 1 (1D): non-polar
- Column 2 (2D): mid-polarity
- Splitless injection
- Flow: 2mL/min (He)
- Temperature Ramp: +5°C/min.
- Inlet Temperature: 250°C

### DATA ANALYSIS

ChromaTOF



## Conclusion

- Many hazardous compounds were identified.
- Some carcinogenic compounds: Furan, Ethylbenzene, p-Cresol, Naphthalene, Benzofuran, Benzene, etc.
- Other compounds were health hazards, respiratory and cardiovascular toxicants, terpenes and corrosive compounds such as p-Cresol and addictive compounds such as Nicotine.
- These compounds are getting trapped in everyday clothing of those who smoke cannabis and tobacco.
- People are being exposed to hazards associated with smoke unknowingly.

## Future research/improvements:

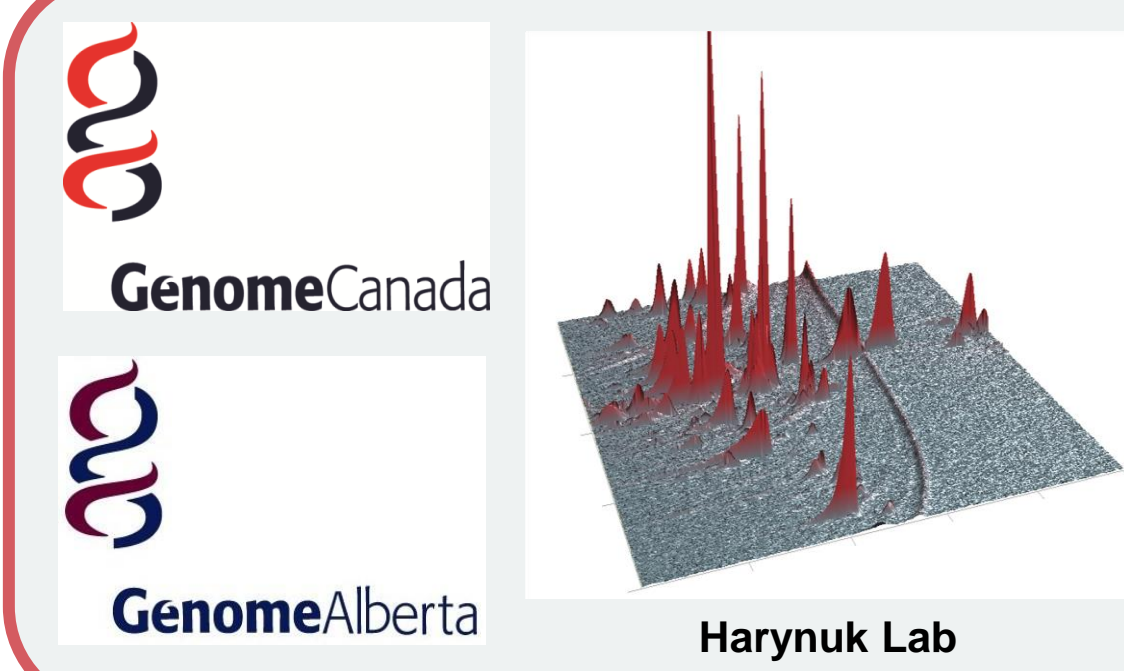
- Design a more effective sample rack to hold fabrics to ensure even exposure of all fabric samples to smoke particles.
- Test this using e-cigarettes; third-hand exposure vapour from e-cigarettes.
- Analyze exposed samples after being washed; what compounds are still trapped in fabric fibers even after being cleaned?

## References

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