



LUND UNIVERSITY

Exposure to microbial compounds from waterpipe tobacco smoke

Löndahl, Jakob; Markowicz, Pawel; Wierzbicka, Aneta; Suleimanc, R; Shihadeh, Alan; Larsson, Lennart

2015

[Link to publication](#)

Citation for published version (APA):

Löndahl, J., Markowicz, P., Wierzbicka, A., Suleimanc, R., Shihadeh, A., & Larsson, L. (2015). *Exposure to microbial compounds from waterpipe tobacco smoke*. Abstract from Nordic Society for Aerosol Research (NOSA) Annual Symposia, 2015, Kuopio, Finland.

Total number of authors:

6

General rights

Unless other specific re-use rights are stated the following general rights apply:

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

Read more about Creative commons licenses: <https://creativecommons.org/licenses/>

Take down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

LUND UNIVERSITY

PO Box 117
221 00 Lund
+46 46-222 00 00

Exposure to microbial compounds from waterpipe tobacco smoke

J. Löndahl¹, P. Markowicz², A. Wierzbicka¹, R. Suleimanc³, A. Shihadeh³, L. Larsson²

¹Division of Ergonomics and Aerosol Technology, Lund University, P.O. Box 118, SE-221 00, Lund, Sweden

²Division of Medical Microbiology, Lund University, P.O. Box 118, SE-221 00, Lund, Sweden

³Mechanical Engineering Department, American University of Beirut, Beirut, Lebanon

Keywords: bioaerosol, exposure, lung deposition, effective density

INTRODUCTION

Cigarette tobacco contains large amounts of bacteria as well as molds and the smoke is rich in microbial compounds (Larsson et al., 2008). However, there have been no studies on the possible presence of microbe-derived substances in waterpipe tobacco and smoke. Because of the significantly lower temperature of the tobacco in a waterpipe compared to a cigarette, microbial substances may be more efficiently preserved in the smoke. The aim of the present study was to measure some selected microbial compounds in waterpipe smoke and to estimate the respiratory tract deposition.

METHODS

Second hand waterpipe and cigarette smoke was studied from 60-120 minute smoking sessions in a 22 m³ stainless steel chamber. In addition, mainstream and sidestream waterpipe smoke was machine-generated. Waterpipe smoke was analysed for bacterial lipopolysaccharide (LPS) and fungal ergosterol. The aerosol in the chamber was also characterized for particle size distribution in the range 10-650 nm with a scanning mobility particle sizer (SMPS) and mass concentration with a tapered element oscillating microbalance mass concentration (TEOM, Ruprecht & Patashnik Inc.). The effective density of the particles in the size range 70-420 nm was measured with an aerosol particle mass analyzer (APM, model 3600, Kanomax, Japan). The respiratory tract deposition of the second hand smoke particles was estimated based on the Multiple Path Particle Dosimetry (MPPD) model (version 2.11; Chemical Industry Institute of Toxicology, Research Triangle Park, NC).

CONCLUSIONS

This is the first time that waterpipe smoking has been shown to create a bioaerosols (Table 1).

Table 1. Amounts (mean) of total particulate matter (TPM), ergosterol, and LPS in smoke per machine waterpipe smoking session (n = 10).

| | Mainstream | Sidestream |
|-----------------|-------------|---------------|
| TPM (mg) | 1870 (310) | Not available |
| Ergosterol (ng) | 84.4 (51.2) | 0.64 (0.82) |
| LPS (pmol) | 1800 (300) | 17.0 (4.7) |

These results are significant since there is a known association between bioaerosols and respiratory disorders such as chronic obstructive pulmonary disease (COPD). The effective density of the second hand smoke particles is shown in Figure 1. The limited decrease of effective density with size is consistent with incomplete combustion, but may also be due to particle restructuring during inhalation. Almost 50% of the particles deposit in the pulmonary region of the lungs.

A comprehensive description of the study is provided by Markowicz et al. (2014).

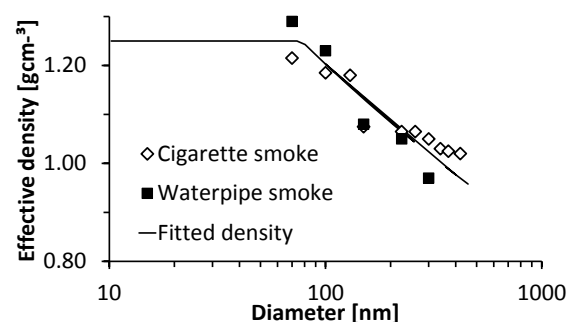


Figure 1. Effective density of the smoke particles.

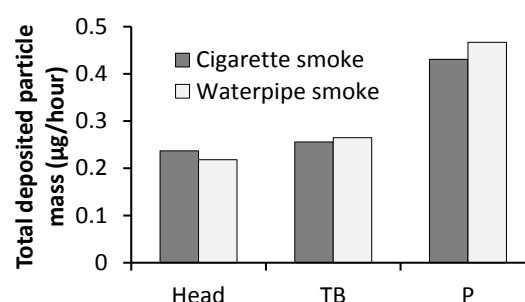


Figure 2. Calculated deposition in head airways, tracheobronchial (TB) and pulmonary (P) regions.

ACKNOWLEDGEMENTS

Grants from FAMRI, VR, FORMAS, VINNOVA, and the US NIH.

REFERENCES

- Larsson L, et al. (2008) "Identification of bacterial and fungal components in tobacco and tobacco smoke". *Tob Induc Dis* 2008;4:4
- Markowicz, P., et al., (2014), "A study on particles and some microbial markers in waterpipe tobacco smoke", *Science of the Total Environment*, 499:107-113