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## 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 $m^3$ 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 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).

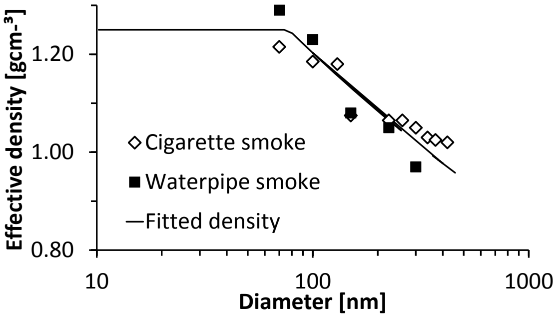


Figure 1. Effective density of the smoke particles.

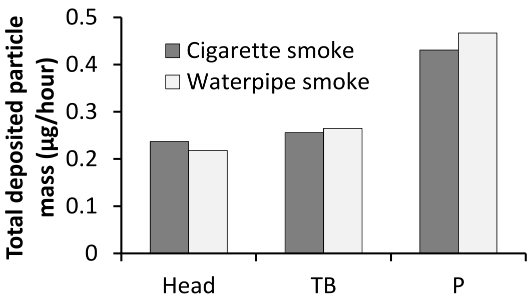


Figure 2. Calculated deposition in head airways, tracheobronchial (TB) and pulmonary (P) regions.

## ACKNOWLEDGEMENTS

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