

# Cytotoxicity caused by combustion particles from different wood species

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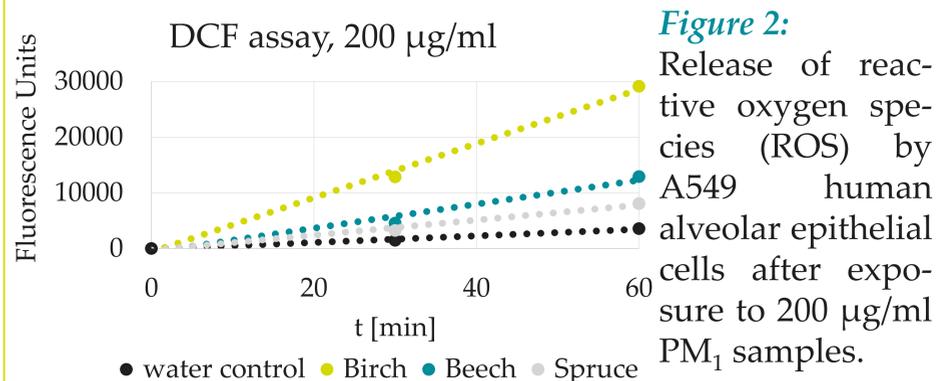
## Introduction

An important source of fine particulate air pollution is wood combustion and many studies have pointed out that these emissions can exacerbate asthma, other respiratory and cardiovascular diseases. Log wood combustion and its emissions have been investigated previously and it has been concluded that both the type of appliance used for the combustion, as well as user related practices (e.g. overloading, inappropriate air supply) have an effect on the chemical composition and the toxicity of the emissions. However, the information on how different wood species affect the toxicity of the emissions is limited.

## Methods

Uniformly sized logs of beech, birch and spruce were combusted in batches in a modern soapstone masonry heater. Particulate emission samples were collected using a Dekati® Gravimetric Impactor (DGI) and the PM<sub>1</sub> fractions were pooled and extracted using methanol for chemical and toxicological analyses.

Chemical analyses of the particulate samples were conducted and the particles' ability to induce toxicological responses was tested using various assays of cytotoxicity (MTT assay, PI exclusion, Neutral Red Assay, Total Protein Content, release of reactive oxygen species (ROS)), inflammation (IL-8, IL-6, TNF $\alpha$ ) and DNA damage (SCGE assay) in a human alveolar epithelial cell line (A549).



## Results

- Birch combustion emissions caused a significant reduction of the cellular metabolic activity (CMA) as well as the highest inflammatory responses and the highest production of ROS, but no cell membrane damage (data not shown)
- Beech combustion emissions caused the most pronounced reduction of CMA and also cell membrane damage (data not shown), but we saw no inflammatory responses and ROS production was comparably low
- Spruce combustion emissions caused the least effects overall: slight, but not dose-dependent decrease in CMA, no cell membrane damage (data not shown), and only slightly elevated production of IL-8 and ROS

## Conclusions

The used wood species has a significant effect on the toxicity of particulate emissions from the batch combustion of wood logs in a modern masonry heater. In this study, all tested wood species – birch, beech and spruce – induced cytotoxicity *in vitro*, but through different pathways.

## Acknowledgements

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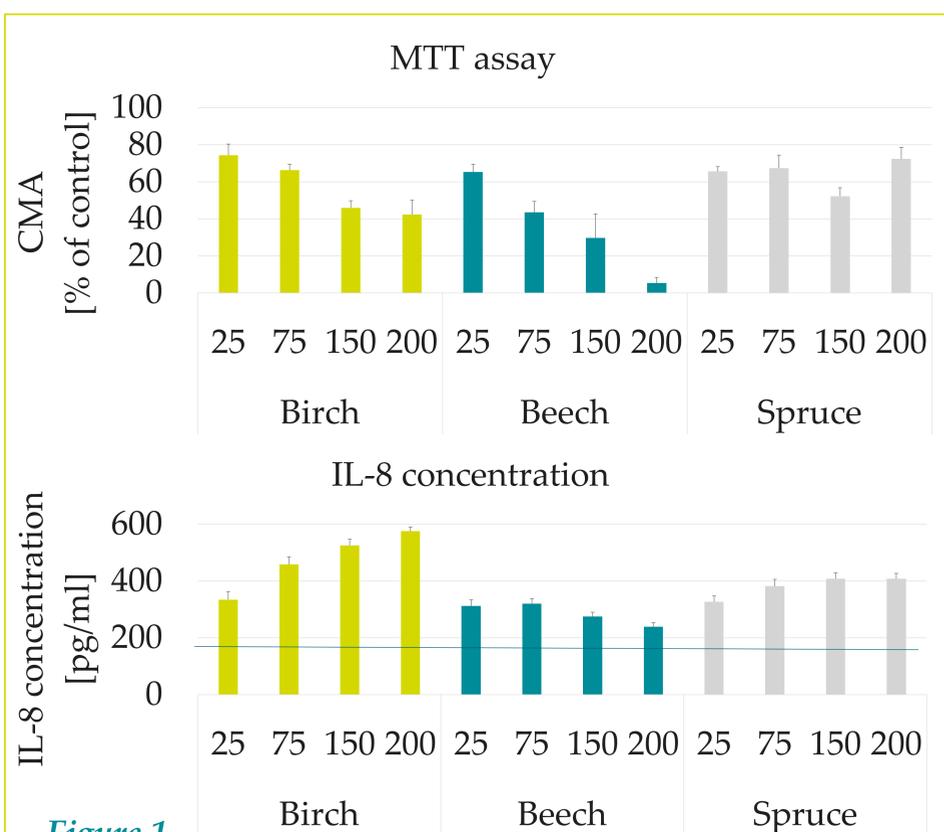


Figure 1

Cellular metabolic activity (CMA) and IL-8 release of A549 human alveolar epithelial cells after a 24 h exposure to four doses (25, 75, 150 and 200 µg/ml) of PM<sub>1</sub> samples from the batch combustion of birch, beech and spruce logs in a masonry heater.