

PUPO-health / BIOMASS-PM: Chemical characterization and toxic activity of wood combustion particles

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State-of-the-art knowledge on health effects of urban particulate air pollution

- Thoracic particles (PM₁₀; diameter < 10 μm) and fine particles (PM_{2.5}; diameter < 2.5 μm) consistently associated with mortality, hospital admissions and functional decrements in respiratory and cardiovascular patients
- Mass-based PM exposure-response relationships vary
 - in different regions of Europe
 - may be stronger with enhanced contributions by certain local sources to PM mass (traffic, domestic heating with coal and wood, poorly controlled metal industry)
 - PM sources and chemical compositions responsible for the extensive public health impacts in both well-developed and less advanced countries are insufficiently known

Clean Air for Europe (CAFE) assessment on health impacts of PM_{2.5} in EU25 (2000)

Premature death cases	347 900
Life years lost	3 618 700
Infant death cases (0-1 y)	677
New cases of chronic bronchitis	163 800
Hospital admission cases (lung + heart)	100 300
Lower respiratory symptom days (5-14 y)	192 756 400
Restricted activity days in adults (15-64 y)	347 687 000
Value of health damage	268 - 781 billion € / year

PUPO-health project

- **Funding:** Tekes 140000 euros and the Ministry of Social Affairs and Health 60000 euros
- **Partners:** National Public Health Institute (**KTL**), University of Kuopio (**UKU**), Finnish Meteorological Institute (**FMI**) and Finnish Occupational Health Institute (**TTL**) + as self-funded partner Helsinki Metropolitan Area Council (**YTV**)
- **Objectives:** To add and test the feasibility of a toxicological health section in research on particulate emissions from small-scale wood combustion

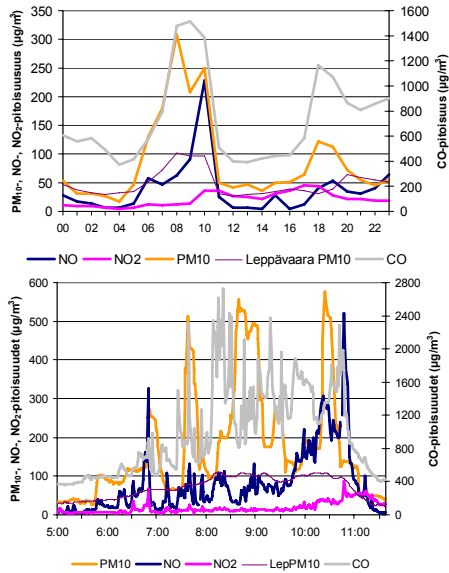
PUPO-health research teams

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- **UKU:** Jorma Jokiniemi, Jarkko Tissari, Kati Hytönen, Timo Turrek
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- **TTL:** Hannu Norppa, Hanna Lindberg, Satu Suhonen
- **YTV:** Päivi Aarnio, Anu Kousa, Tarja Koskentalo

Particulate collection from dilution tunnel with validated low-volume samplers and for toxicology with a high-volume cascade impactor (HVCI)



Lintuvaara, Espoo 13.10.2005



- Air quality impact of wood combustion in an older residential area during weak winds and temperature inversion

- Higher PM₁₀ concentrations and different time-series than in traffic environments

- Different composition

- up to 60% of single particles originated from combustion source (SEM-EDX)

- more K-rich particles than in other monitoring stations

(YTV Regional and Environmental Information)

Conclusions

- Poor user practice in wood burning in masonry heater

- Higher emissions of ultrafine and fine particles
- Higher emissions of PAHs
- Higher toxicity of ultrafine and fine particles

- Impacts of poor wood burning on air quality and human health

- Health-based EU limit values for PM₁₀ (and future PM_{2.5}) and target value for benza[a]pyrene (PAH) may be exceeded in areas with older residential buildings and heaters
- High pollutant concentrations and increased PM toxicity are likely to be reflected in personal exposures and health of residents (need to be investigated)