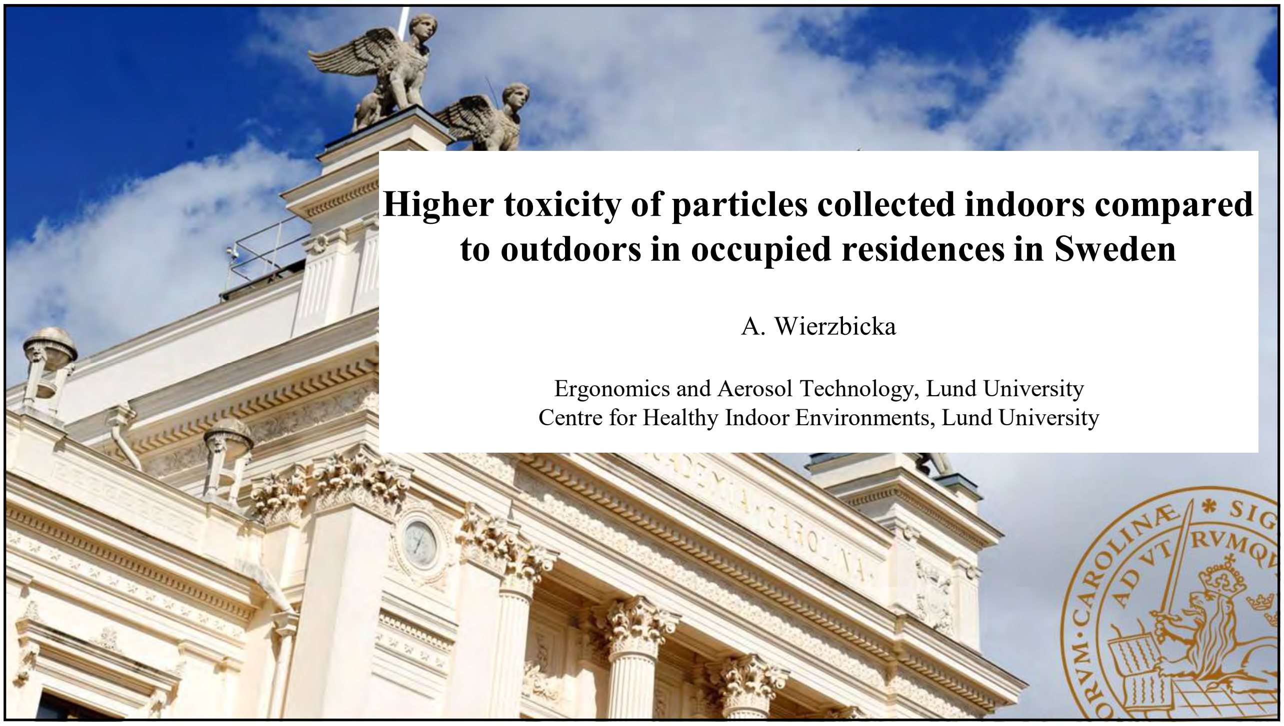

Higher toxicity of particles collected indoors compared to outdoors in occupied residences in Sweden

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1

Airborne particles in our homes: cocktail effects, chemical composition, physical characteristics and toxicity.

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2

3

4

When assessing exposure to airborne particles, indoor environments are considered as places where people are exposed to particles of outdoor origin.

What about indoor sources?

Do the indoor sources matter from health effects perspective?

5

Aims

1. To determine differences in toxicity of particles inside and outside occupied residences by conducting toxicological studies in mice
2. To assess physico-chemical properties of airborne particles inside and outside occupied residences in Sweden

6

Measuremnets

- Measurements in 15 occupied residences were performed
  - ✓ 3 detached houses with natural ventilation
  - ✓ 1 apartment with natural ventilation
  - ✓ 11 apartments with mechanical ventialtion
- Week long measurements during winter time (October – April)
- Measuremnets were conducted simultanously inside and outside
- Instructions were given to occupants to ensure that periods with active indoor sources were captured
- Occupants were asked to keep log books
- Air exchange rates were assessed and building characteristics gathered

7

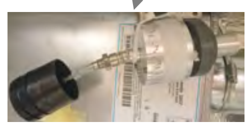
8

Measurements

NanoTracer
particle number concentration, mean size (10-300 nm)

DustTrack DRX
Proxy mass conc., PM2.5 particles collection for gravimetric, PAHs, metals and ions analysis

Mini-aethalometer
black carbon mass concentration



PM2.5 collection
for endotoxins analysis

Dekati Gravimetric Impactor, PM2.5
for toxicological studies

9

Toxicological testing in mice

Female C57BL/6 mice (N=6)

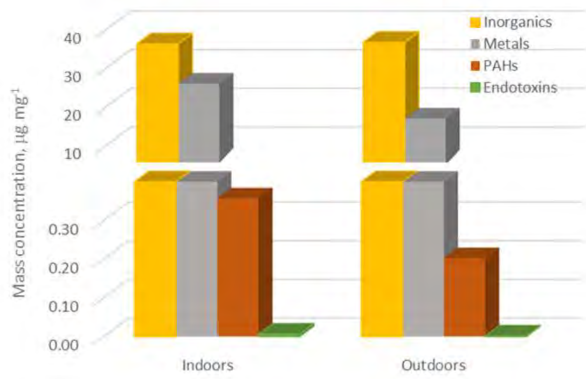
Mice received a single intratracheal instillation of 18, 54 and 162 µg of each of the pooled particle samples. Suspended in NanoPure water with 0.1% Tween80

Carbon Black Printex 90/XE-2B was used as a positive control

Lung inflammation and DNA damage in broncheoalveolar lavage (BAL) cells and lung tissue were evaluated 1, 3 and 28 days after intratracheal instillation.

10

Chemical composition of extracted $PM_{2.5}$ particles



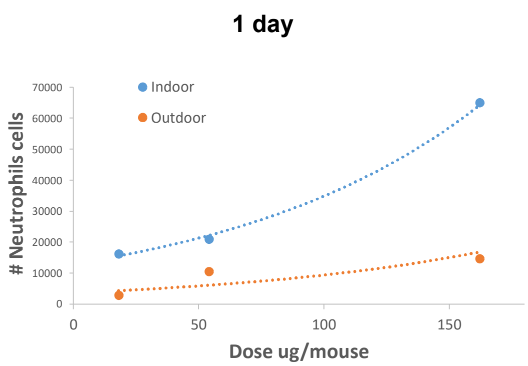
	Indoors	Outdoors
PM2.5(µg m^3)	7.5	7.3
UFP (cm^{-3})	8900	2900

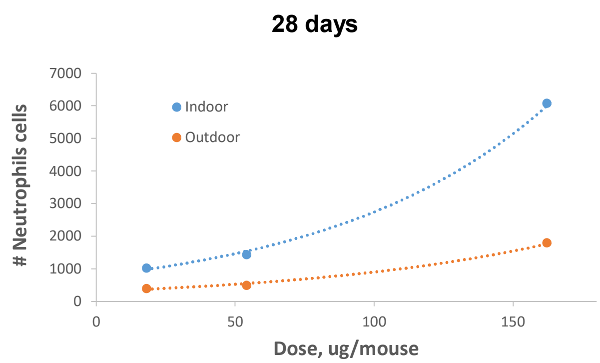
Inorganics (Si, P, Na, K, Ca),
Metals (Al, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, tot-As, Cd, Ba, Tl, Pb, Mg),
PAHs (16 priority U.S. EPA PAHs)

11

Observed effects

In broncheoalveolar lavage (BAL) after a single intratracheal instillation of 18, 54 and 162 µg of particles after





12

Conclusions

- Higher concentrations of metals, PAHs and endotoxins in PM2.5 were determined in collected particles indoors compared to outdoors
- Indoor particles displayed higher toxicity than outdoor particles under the studied conditions
- Reducing exposure to particles indoors requires reduction of both infiltration from outdoors and indoor-generated particles.

13

Take home message

- By reducing the concentration of pollutants inside the buildings, we will improve the indoor air quality and contribute to creation of healthier indoor environments
- As airborne particles can act as carriers of viruses and bacteria, the reduction of airborne pollutants indoors will contribute to lower risk of spread of the airborne diseases

14