

THE UFIGREG PROJECT

The project UFIGREG (Ultrafine particles and health - an evidence based contribution to the development of regional and European environmental and health policy) aimed to improve our knowledge on health effects of ultrafine particles.

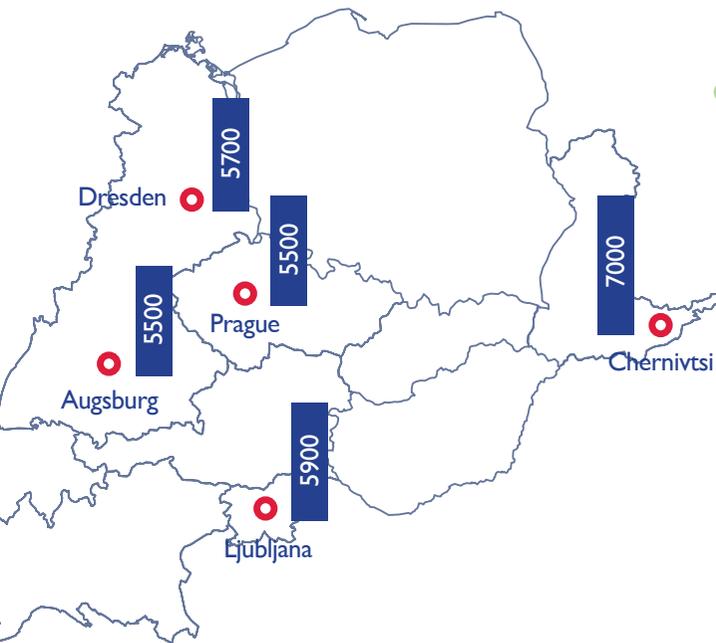
WHO: Researchers from the field of environment and public health from four European countries

WHEN: July 2011 to December 2014

HOW:

- Establishing harmonised and quality-assured measurements of UFP
- Investigating short-term effects of UFP on daily counts of hospital admissions and natural deaths, especially in relation to cardiovascular and respiratory diseases

WHERE: Five cities in the Czech Republic (Prague), Germany (Augsburg, Dresden), Slovenia (Ljubljana) and Ukraine (Chernivtsi) (F2)



(F2) Annual mean concentration of UFP (10-100 nm) in 2013 in particles per cm³.

More information: www.ufireg-central.eu

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Ultrafine particles -
Too small to see,
but too big to ignore



AIR POLLUTION - A PERSISTING PROBLEM

Air quality is an important determinant of health. Epidemiological studies have shown that particulate matter ($PM_{10}/PM_{2.5}$) is associated with adverse health effects. The elderly, children and people with pre-existing diseases such as cardiovascular diseases and diabetes are considered to be at particular high risks (F1).



(F1) adapted from Ruckerl, R., Schneider, A., Breitner, S. et al (2011): Health Effects of Particulate Air Pollution – A Review of Epidemiological Evidence. *Inhalation Toxicology* 23(10), 555-592.

ULTRAFINE PARTICLES - TOO SMALL TO SEE, TOO BIG TO IGNORE



Ultrafine particles (UFP) are the smallest constituents of airborne particulate matter. They are smaller than 100 nanometres. This means that the size of an ultrafine particle is about 1/1000 of the diameter of a human hair.

With every breath, these tiny particles are inhaled into our body. UFP can be inhaled more deeply into the lungs than larger particles. They may penetrate the lung membranes, reach the bloodstream and can be transported to different organs such as heart, liver, kidneys and brain. UFP therefore are likely to have adverse health effects. However, up to now there is not enough conclusive evidence on health impact of ultrafine particles.

AIR QUALITY IN THE FIVE UFIREG CITIES

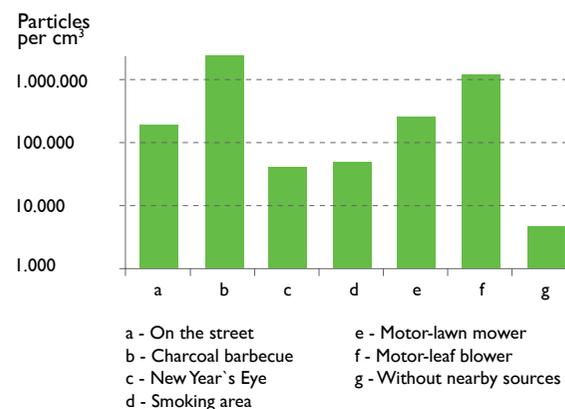
Due to their small size, UFP contribute little to the total mass of particulate matter. Whereas for larger particles, the mass per air volume is measured, it is more suitable for UFP to determine particle number per air volume.

UFIREG partners determined the ambient particle number concentration of particles in different size ranges between 10 and 800 nanometres per cm^3 . All of the UFIREG measurement stations were located at suburban or urban background sites to be representative for a large number of citizens. No roads with heavy traffic were situated in immediate vicinity.

SOURCES OF UFP

In urban areas, UFP are mostly emitted by man-made sources like traffic, domestic heating, and industrial plants. Since these sources are all related to combustion processes, UFP often contain soot.

Besides traffic, people can be temporarily exposed to high number concentrations of particles in various everyday life situations such as during barbecues, bonfires, in smoking areas, beside motor-leaf blowers or motor-lawn mowers (F3).



(F3) Maximum (peak) particle number concentrations determined with a mobile particle counter

EVIDENCE FOR HEALTH EFFECTS

UFIREG partners have investigated the association between air pollution concentration and daily cardiovascular and respiratory hospital admissions and mortality. Across all five cities involved in the study, an increase of about 2% in respiratory hospital admissions and mortality was associated with a 1,000 particles/ cm^3 increase in daily UFP concentrations.

Both for hospital admissions and mortality, delayed effects were found, meaning that UFP concentrations were associated with an increase in hospital admissions and mortality a few days later. Results on adverse effects of UFP on cardiovascular health were less conclusive.

CONCLUSIONS

Current data and studies on levels of UFP and their health effects do not yet allow firm conclusions on exposure limits. On the other hand, to date, UFP are not included in routine measurements of air quality monitoring stations. This in turn causes a lack of data for studies investigating effects of UFP on human health.

Therefore, continued efforts are needed to routinely monitor UFP and generate data for epidemiological studies to increase our understanding of health effects of UFP.

WHAT CAN I DO TO REDUCE EXPOSURE?

Everyone can contribute to reduce UFP emissions. Actions you can take include:

- consider to use public transport whenever possible
- decide to walk or cycle more often instead of using your car
- drive vehicles with reliable filter systems or choose alternative energy sources for vehicles
- reduce wood combustion, especially with old fireplaces and stoves