



# UFIREG

Ultrafine particles –  
cooperation with environ-  
mental and health policy

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Newsletter 1 / October 2011

## 1<sup>ST</sup> NEWSLETTER

The today's newsletter deals with ....

### TOPIC 1

Introducing the UFIREG project

### TOPIC 2

Introducing the topic – ultrafine particles measurement and human health

### TOPIC 3

Link to the UFIPOLNET project

### TOPIC 4

Introducing the team

### TOPIC 5

Start-up phase

**When:** 1<sup>st</sup> July 2011 to 31<sup>st</sup> December 2014

**How:**

- Measuring ultrafine particles and analyzing the impact on human health
- Giving recommendations to the environmental policy in Europe
- Publishing all results to health insurance providers, local and national policy makers, environmental and health authorities as well as citizens

**Where:** In five European cities (Dresden, Augsburg, Prague, Ljubljana and Chernivtsi)

**Why:** Ultrafine particles could have an influence on person's health

Information on health effects of ultrafine particles is still limited, especially on a geographic basis. This project will investigate the short-term effects of size-fractionated ultrafine particles on mortality and morbidity in Germany, the Czech Republic, Slovenia, and the Ukraine.

## TOPIC 1 – INTRODUCING THE PROJECT

**Aim:** Contribution to improve air quality and to save peoples health in Europe

**Who:** Experts from the fields of environment/ air pollution and human health from four European countries (Germany, Czech Republic, Slovenia, Ukraine)

## TOPIC 2 - INTRODUCING THE TOPIC

### Introducing the topic – Definition of ultrafine particles and why it is important to measure them

Ultrafine particles (UFP) are of major concern to public health. They can deposit deeply in the lung and may cause different complaints. Until today there exist no regulations by law for the determination of their concentration in the ambient air. The prescribed grave limits for the particulate matter (fine dust-PM<sub>10</sub> or PM<sub>2.5</sub>) are not suitable for ultrafine particles because they are so tiny, smaller than 100 nanometers, and have almost no measurable mass. Hence the particle number concentration (PN) seems to be a better indicator to define the exposure to ultrafine particles in ambient air. Therefore there is a need for appropriate measuring instruments and their use in air quality monitoring networks arises. Only few measurements are currently taken in European networks.

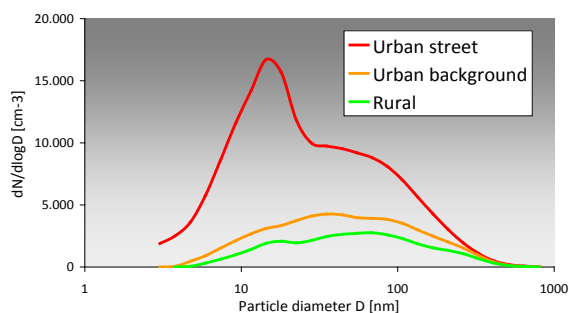
The whole amount of environmental relevant particles is a mixture of different sizes and compositions. In urban air most of the ultrafine particles originate from exhaust fumes and are encountered above all in zones with heavy traffic, for example, along main roads. They are therefore primarily composed of soot, organic compounds (often toxic) and to a lesser extent of metals. In addition the particle number concentration varies during the day, week and year according to the traffic rush hours and weather conditions.

The comparison of measured data regarding particle size and number distributions at different locations over many years aims to show the improvement of air quality in European cities. Determining the particle size distribution provides furthermore the

possibility to characterise the origin of the particles because the retention/dwell time in the atmosphere differs with size. In the five European cities of the UFIREG project partners we will therefore measure five fractions of particles in the range of 20 to 200 nanometers. Because quality assurance is also a critical point we will compare and calibrate all measuring instruments consistently within the scope of the project.



Scanning Mobility Particle Sizer, TypeSMPS-IIFT: It indicates the size and the number of particles

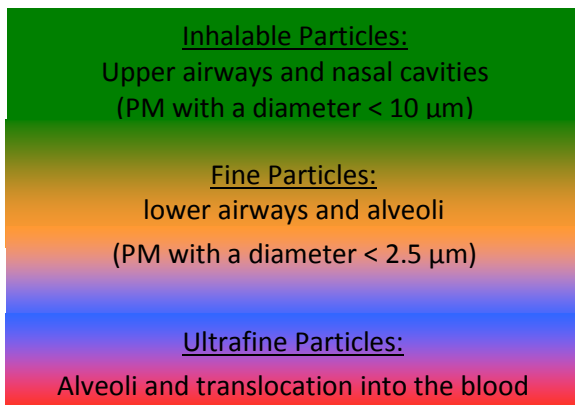


Particle number and size distribution at three different locations in Saxony (modified from Löschau et al., (modified

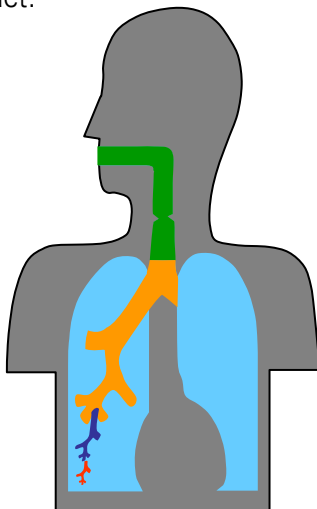
from Löschau et al., Air Quality Control 71 (2011) Nr. 1/2)

## Estimated impact of UFP on human health

Ultrafine particles are most commonly defined as having an aerodynamic diameter of 0.1  $\mu\text{m}$  and smaller. UFP are about the same size as viruses and considerably smaller than bacteria (or about 1000-times smaller than the diameter of a human hair). Several epidemiological and toxicological studies suggest that UFP may cause adverse human health effects greater than or independent of the effects due to the larger particles.



Particle deposition profile in the respiratory tract.



Compared to larger particles, UFP have a larger surface area per given mass. The

large surface area allows UFP to act as carriers for other pollutants, such as organic compounds or trace metals. The co-pollutants coating the surface of the particles erode in the lung and are then transported through the lining of the lung into the bloodstream. Even when the UFP are not particularly toxic, there is evidence that they can initiate oxidative stress in the lung. Oxidative stress is a process which alters lung cell chemistry, causing inflammation and setting in motion a cascade of health problems. In addition to the co-pollutants, many UFP are small enough to cross the lung membranes and reach the bloodstream. There, they can cause immune responses such as thickening of the blood, which leads to an increased chance of heart attacks and strokes. Also, they can be transported to different organs such as liver or heart via the blood stream. Elderly people and people with pre-existing diseases such as heart diseases and diabetes are supposed to be at special risk.

### Literature

Peters, A., R ckerl, R., Cyrus, J. (2011): Lessons Learned from Air Pollution Epidemiology. J Occup and Environ Med, 53, S8 - S13.

R ckerl, R. Schneider, A., Breitner, S., Cyrus, J., Peters, A. (2011): Health Effects of Particulate Air Pollution - A Review of Epidemiological Evidence. Inhalation Toxicology 23(10), 555 - 592.

## TOPIC 3 – LINK TO THE UFIPOLNET PROJECT

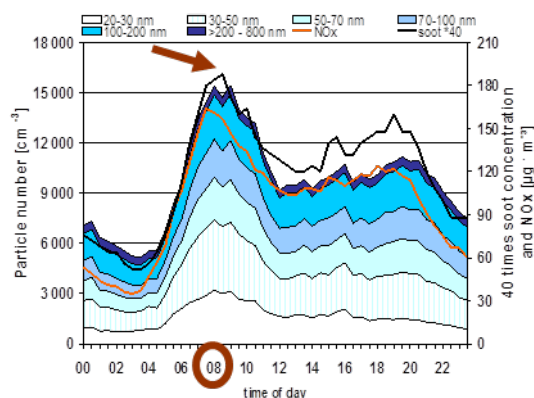
The UFIREG-project refers to and benefit from a former EU-funded project named UFIPOLNET (**U**ltra **F**ine Particle Size Distributions in Air **P**OLLution Monitoring **N**ETworks) which was finished in 2008.

The objective of this project was the development of an instrument prototype for measuring ultrafine particles in ambient air easily, reliable, with affordable start-up and operating cost and neither using chemicals nor radioactivity. This included the work of experts from air quality control and researchers who worked with routine monitoring systems. Within the scope of UFIPOLNET four prototypes of Ultrafine Particle Monitors were built. They were used to examine six size categories of particles from 20 to 800 nanometres at four measurement sites in Europe (Augsburg, Dresden, Prague and Stockholm).

The analyzed data showed variations between the locations due to the urban position of the measuring point and the distance to roads with heavy traffic. In Augsburg, where the measurement container is distant from roads with heavy traffic, the number concentration was low while in Stockholm along a very busy road which was surrounded by street canyons, the number concentration is the highest.

The measurement results also indicated high concentrations during the morning rush hour around 8 a.m., similar to nitrogen oxides and soot (H. Gerwig, Presentation Kick-off Meeting UFIREG, 11<sup>th</sup> July 2011).

For more information see the **Citizens' Report** of the UFIPOLNET-project.



## TOPIC 4 – INTRODUCING THE TEAM

### Technische Universität Dresden



Research Association Public Health  
Saxony and Saxony-Anhalt  
Fiedlerstraße 33  
01307 Dresden  
Germany

#### Persons involved:

Prof. Dr. Dr. Wilhelm Kirch – Project leader, project manager  
Beatrix Hörger – Secretary  
Anne Müller-Schuchardt – financial expert and responsible for communication  
Anja Zscheppang – responsible for research activities and communication

#### Role in the UFIREG project:

The Research Association Public Health Saxony and Saxony-Anhalt at the Technische Universität Dresden has expertise in the field of medicine and public health focusing on lifestyle, environmental and migrant health. It is project leader of the UFIREG project. It is experienced in the field of environmental health. Several projects were conducted. We, the staff of the Research Association Public Health Saxony and Saxony-Anhalt, are responsible for project management, including communication and financing. We are the central contact point for partners and for the funding institution Interreg IVB Central Europe which is located in Vienna. The staff of the Research Association Public Health Saxony and Saxony-Anhalt is involved in scientific tasks and overtakes the health part in the project, disseminated project results, informs target groups about the

project activities, develops recommendations to improve air quality and to protect human health.

### Saxon State Agency of Environment, Agriculture and Geology

LANDESAMT FÜR UMWELT,  
LANDWIRTSCHAFT  
UND GEOLOGIE



Freistaat  
SACHSEN

Pillnitzer Platz 3  
01326 Dresden  
Germany

#### Persons involved:

Dr. Andrea Hausmann – head of division  
Dr. Gunter Löschau – expert in measuring ultrafine particles  
Dr. Susanne Bastian – desk officer for the UFIREG project  
Enrico Reichert – responsible for measurement (State Department for Environmental and Agricultural Operations in Saxony)

#### Role in the UFIREG project:

The Saxon State Agency yields long-term experience in assessing air quality, measuring ultrafine particles, establishing clean air plans and cooperation with local and regional authorities. Together with the State Department they will collect meteorological and environmental data including the number of ultrafine particles at one urban background station in Dresden as basis for the epidemiological study. Analyzing the development of the particle number concentration, identification of the polluters and recommending measures are further tasks of the State Agency.

## German Research Center for Environmental Health

### HelmholtzZentrum münchen

German Research Center for Environmental Health

Institute of Epidemiology II  
Ingolstaedter Landstrasse 1  
85764 Neuherberg  
Germany

#### Persons involved:

Prof. Dr. Annette Peters – institute director

Dr. Josef Cyrys – expert in exposure assessment of air pollutants for epidemiological studies

Dr. Susanne Breitner – expert in statistical analysis and epidemiological studies

Dr. Mike Pitz – expert in measuring of ambient air pollutants, particularly ultrafine particles

Dr. Alexandra Schneider – expert in epidemiological studies

Dr. Regina Ruckerl - expert in epidemiological studies and literature reviews

#### Role in the UFIREG project:

The Helmholtz Zentrum München (HMGU) has many years of experience in assessing air quality at a technologically advanced level including the measurement of ultrafine particles, but also in conducting and analyzing epidemiological studies on air quality and air temperature. Together with the University of Augsburg – Environmental Science Center, they will collect meteorological and environmental data including particle number concentrations at one urban background station in Augsburg, Germany, as basis for the epidemiological study (WP4). The particle number concentrations will be collected by use of the new developed UFP 330 as well as an already running and well established TDMPS system. Further tasks will be a comprehensive literature review

and the assessment of the health effects of ultrafine particles on morbidity and mortality. Finally, HMGU will be responsible for the dissemination of the results to target groups: development of the recommendations and strategy of UFP measurements as well as of the dissemination material.

## Institute of Experimental Medicine AS CR., v.v.i.



Institute  
of Experimental  
Medicine AS CR, v.v.i.

EU Centre of Excellence

Videňská 1083  
142 20 Praha 4  
Czech Republic

#### Persons involved:

MUDr. Miroslav Dostál, DrSc.

MUDr. Anna Pastorková, CSc.

#### Role in the UFIREG project:

The Research in the Department of Genetic ecotoxicology concentrates mostly on the effects of air pollution on genetic material, on the mechanisms of changes induced by environmental factors as well as modeling the relationships between individual factors (e. g. air pollution vs. life style), and the genetic damage caused by genotoxic and carcinogenic studies. In the UFIREG project we will analyze data on hospitalizations (on a daily bases) of patients in Prague to look for an association of respiratory and cardiovascular diseases with concentration of ultrafine particles measured by the Czech Institute of Hydrometeorology in Prague. They will also collect data on daily mortality.

## Czech Hydrometeorological Institute



Na Šabatce 17  
14306 Prague 4  
Czech Republic

### Person involved:

Dr. Jiri Novak

### Role in the UFIREG project:

Authorised by the ministry of the Environment, the CHMI is responsible for air quality measurement and assessment in the Czech Republic. Performance of these tasks is required by national and EU legislation (Act No.86/2002 as amended and Directive 2008/50/EC). The measuring network covers the entire Czech Republic and provides data on the concentration of all the pollutants required by the Directive. In line with the requirements, the greatest attention is devoted to the monitoring of the concentration of suspended particulates and the substances bound to them (heavy metals /HM and polyaromatic hydrocarbons/PAH). The Institute promotes co-operation primarily at the European level, with the European Environment Agency (EEA) in the area of air quality assessment and with the Joint Research Centre (JRC) in the area of air quality measurement. Extensive activities geared towards air quality and emission measurement are pursued under the Convention on Long-Range Transboundary Air Pollution (CLRTAP). The CHMI is responsible to measure ultrafine particles in Prague.

## Institute of Public Health Celje



Ipavceva ulica 18  
3000 Celje  
Slovenia

### Persons involved:

Simona Ursic – project leader/manager  
Ziva Erzen – project coordinator  
Andrej Ursic – responsible for measurement activities  
Matevz Gobec – responsible for measuring of ultrafine particles  
Nevenka Rahten – financial expert  
Damjana Leskosek – responsible for public procurements  
Ksenija Lekić – responsible for promotion  
Alenka Storman – project supervisor

### Role in the UFIREG project:

The main role of the Institute of Public Health Celje in the UFIREG project, as a project partner, is to carry out measurements of ultrafine particles in urban environment and to study the health consequences that might be found among exposed population. Measurements will be performed in the capital of Slovenia in Ljubljana. They will present the project aims and the intermediate and final results to the different stakeholders in Slovenia, but also give support to the lead partner and other project partners and contribute to the fulfillment of the UFIREG project aims.

**Department of Medical and Ecological Problems,  
L.I.Medved's Institute of Ekohygiene and Toxicology,  
Ministry of Health, Ukraine**



Heroiv oborony str., 6  
03680 Kyiv  
Ukraine

Persons involved:

Prof. Dr. Dr. Mykola Prodanchuk, director,  
Steering Committee member

Prof. Dr. Dr. Leonid Vlasyk, local  
coordinator, Scientific Committee member

Tetjana Kolodnitska - responsible for  
epidemiological data and communication

Bogdan Mykhalchuk – responsible for  
measurement

Olena Koldrish - Secretary

Role in the UFIREG project:

State enterprise «L.I.Medved's Institute of Ekohygiene and Toxicology» is competent to implement the results of the project into System of Public Health Protection of Ukraine and into legislation in the field of air quality protection because of the close cooperation with Ministry of Public Health of Ukraine, Regional authorities of Public Health and Environment. The team will collect meteorological and environmental data including the number of ultrafine particles at one urban background station in Chernivtsi, epidemiological data for Chernivtsi will be collected and analyzed.

## TOPIC 5 – START-UP PHASE

The project leader attended three seminars organized by the funding institution CENTRAL EUROPE: firstly an information seminar informing about Central Europe projects and reporting requirement, secondly a financial seminar and thirdly a communication seminar.

Our project started on 1<sup>st</sup> July 2011. The first meeting took place in Dresden at the Technische Universität on 11<sup>th</sup> and 12<sup>th</sup> July 2011. Participants from all project partners were present. We discussed the start-up tasks. The project manager informed about financing, project management and communication. We had two guests invited. Markus Egermann from the National Contact Point in Dresden, Germany gives us support in case that we have questions on reporting and financing during project duration. Dr. Holger Gerwig works at the Federal Environmental Agency in Germany and was a member of the UFIPOLNET project. He was deeply involved in the project and presented us his knowledge and project experiences.

One of the first tasks is the installation of instruments to measure ultrafine particles in the four cities. The measurement has to be prepared; the persons responsible for measurement trained. Data availability of air pollution, environmental, socio-demographic and epidemiological data will be checked in the four cities and data harmonized. In the next months we will start a close communication with policy makers, health insurance providers, environmental and health agencies, citizens, contact partner cities. The 2nd partner meeting will take place in Prague, Czech Republic in January 2012.



## Contact

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