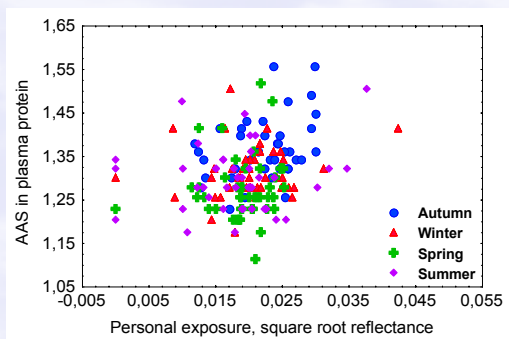


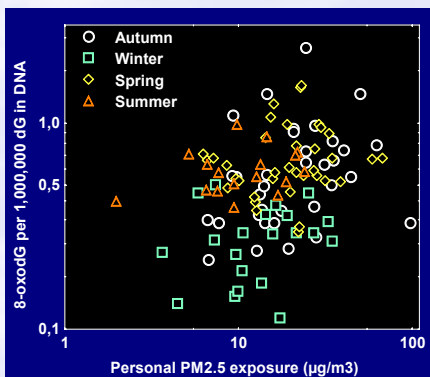
Biomarkers and Air samplers for Assessment of Exposure and Effects of Urban Air Pollution – BIOAIRPEX

In this project determinants and biomarkers of internal and biologically effective dose and susceptibility of personal exposure to particulate matter (PM_{2.5}) and NO_x are assessed in 50 healthy subjects in each of the 4 seasons over one year. Individual samplers and samplers inside and outside the subjects' residence as well as in urban background and busy streets are compared. Biomarkers include a battery of genotoxicity markers, including oxidative DNA damage by comet assay and 8-oxodG and PAH DNA adducts as well as markers of oxidative stress and hematology. Susceptibility markers include a battery of metabolism enzymes. So far, data under publication include significant correlations between biomarkers of oxidative stress and personal exposure to PM_{2.5} black smoke.

The study is continuing with measurement of personal exposure to ultrafine particles and relations to biomarkers of exposure in specified traffic scenarios. The generated data are also used for validation of modeling of exposure based on geographic information systems.



Relationship between personal exposure to black smoke measured as reflectance of PM_{2.5} filter and oxidative stress in plasma assessed as oxidation of amino acids (AAS: aminoaldipic semialdehyde)



Relationship between personal exposure to PM_{2.5} by mass on filter and oxidative damage to DNA in lymphocytes in terms of guanine oxidation ((-oxodG: 8-oxodeoxyguanosine per mill. Deoxyguanosine)

Hertel O, Solvang Jensen S, Andersen HV, Palmgren F, Wåhlin P, Skov H, Nielsen IV, Sørensen M, Loft S, Raaschou-Nielsen O. Human exposure to traffic pollution. Experience from Danish studies. Pure Appl Chem 73 137-145, 2001

Sørensen M, Dragsted LO, Hertel O, Knudsen LE, Loft S. Personal PM_{2.5} exposure and markers of oxidative stress in blood, Environ Health Perspectives, in press

Ongoing epidemiological studies of health effects of air pollution in Denmark

The studies take advantage of a number of large ongoing population studies to address the most pertinent aspects of the health effects related to exposure to traffic generated air pollution, especially particles. Modelling is the main tool for exposure assessment. Overall coordination is by Steffen Loft.

1. Self reported symptoms

Annoyance and symptoms in relation to exposure to air pollution from road traffic will be addressed in 6.000 people studied in the National Health Survey 2000. Principal investigator Lis Keiding, lk@si-folkesundhed.dk

2. Acute cardiopulmonary mortality

The risk of acute morbidity and mortality of cardiovascular and pulmonary diseases requiring admission to hospital during 2 years will be addressed in relation to traffic generated air pollution at the residence, workplace and commuter route. Case-cross-over, nested case-control and time-series designs will be applied in four large population studies in Copenhagen providing a population at risk of approximately 25.000. Principal investigator: Steffen Loft, S.Loft@pubhealth.ku.dk

3. Birth weight

Intrauterine growth retardation and perinatal/infant mortality will be addressed in relation to modelled air pollution concentrations at the residence of 15.000 pregnant women from the Danish National Birth Cohort. Principal investigator: Ole Raaschou-Nielsen, ole@cancer.dk

4. Asthma in children

Exposure to fine particles (PM_{2.5}) as a causal factor in asthma development will be addressed by 3 one-week measurements in the bedrooms of each of 400 infants at high risk of asthma development (Copenhagen Prospective Study of Atopy in Childhood). Principal investigator: Ole Raaschou-Nielsen, ole@cancer.dk

Daily recorded symptoms over the first three years of life will be correlated to daily air pollution levels including sizefractionated particles measured in urban background and estimated by modelling at the residence. Principal investigator: Steffen Loft, S.Loft@pubhealth.ku.dk

5. Asthma and COPD in adults

The development of self-reported asthma and bronchitis in relation to exposure to traffic generated air pollution at the small area level will be studied in a health survey conducted on 3000 persons from the Glostrup Study. Principal investigator: Torben Sigsgaard, ts@mil.aau.dk.

6. Lung cancer.

In a case-cohort design 800 lung cancer cases are identified among participants in a number of Danish population cohorts. A sub-sample of another 800 participants is selected from the cohorts. Residential history (from 1960) is traced by use of population registries and interviews with participants or next-of-kin. Information on work place addresses and transportation between home and work are also collected by interviews. Cumulative exposure to air pollution is estimated by modelling. Relative risks for lung cancer in association with air pollution will be estimated by regression techniques and adjusted for smoking habits and occupational exposures. For part of the study population (250 cases, 250 controls) PAH-DNA adducts will be measured in white blood cells stored in a biobank as a marker of biological relevant exposure and genetic polymorphisms in metabolism and DNA repair enzymes will be analysed as possible effect modifiers. Principal investigators: Steffen Loft, S.Loft@pubhealth.ku.dk and Ole Raaschou-Nielsen, ole@cancer.dk.