

# PERSONAL EXPOSURE TO CARCINOGENIC AIR POLLUTANTS IN STOCKHOLM, SWEDEN: A COMPARISON OVER TIME

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**Background and Aims:** Urban populations are exposed to a complex mixture of air pollution, including volatile organic compounds (VOC), nitrogen oxides and polycyclic aromatic hydrocarbons (PAH), which are carcinogenic or may be seen as indicators of co-emitted carcinogens. The aim of the present study was to measure personal exposure to carcinogenic air pollutants in Stockholm, Sweden, study time-trends, and to compare personal exposure levels with concentrations at outdoor reference sites.

**Methods:** Forty participants, 20-50 years of age, randomly selected among residents in the Stockholm municipality carried diffusion samplers close to the breathing zone for one week. Four different air pollutants were sampled; benzene, 1,3-butadiene, NO<sub>x</sub> and NO<sub>2</sub>. During the measurement period, the participants kept a diary of their daily activities and completed a questionnaire about living conditions and life style factors. Samplers were also placed at two outdoor reference sites during the same time period: one on a roof-top, representing urban background, and one by an inner-city road with heavy traffic. The study was conducted during 7 and 9 weeks during the heating season in 2003 and 2009, respectively.

**Results:** Levels of most of the measured air pollutants had decreased in this six-year period (by approx 50 percent), both for personal exposure and reference sites. At both occasions, the personal exposure levels were higher than the urban background concentrations. Personal levels did also not correlate to concurrent ambient concentrations.

**Conclusions:** Population exposure to combustion-related carcinogens in air has decreased in Stockholm, probably due to increasing use of catalytic converters and to decreased traffic because of congestion taxes. The results indicate that personal exposure levels cannot be evaluated directly from ambient concentrations, making personal sampling essential for risk assessment.