Exposure of schoolchildren to UFP and other traffic-related air pollution: the HEAPS study

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Introduction

Traffic is one of the main sources of BC (Black Carbon), UFP (Ultrafine Particles) and NO_2 in urban environments. In addition, BC and UFP are considered to have a larger health impact (per mass) as compared to PM (Particulate Matter). To assess the health impact of traffic related air pollution on schoolchildren, the HEAPS study (Health effects of air pollution in Antwerp schools) was performed.

The HEAPS study comprises the biomonitoring of 130 children (aged 6-12) from 2 schools by measuring oxidative stress, inflammation and cardiovascular markers and simultaneous air quality monitoring. This paper discusses the air quality measurements and exposure assessment of the schoolchildren.

Methodology

Air quality was monitored in two seasons, spring and autumn 2011. To assess the exposure of the children, air quality measurements were performed at two school locations, at a selection of 40 home locations and while in transport.

At school locations, UFP was measured together with NO_2, NOx, BC and PM-fractions. At the home locations, BC and NO_2 were measured as a proxy of traffic-related air pollution. Each week, UFP measurements were performed at one of these locations in order to investigate correlations of UFP to NO_2 and BC. The land use regression (LUR) technique was applied to model exposure to BC and NO_2 at all home locations. For a selection of routes and three different transport modes (on foot, by car and by bike), UFP and BC were measured to assess the contribution of commuting to integrated exposure. Air pollution measurements are translated into exposure estimates in different time frames.

Results and discussion

The results show a large spatial and seasonal variability on pollutant concentrations (up to a factor 2-3). However, differences were observed between pollutants. A good correlation was found between UFP concentrations and BC or NO_2.

This paper will further discuss the seasonal and spatial variation of UFP, BC and NO_2 at school and home locations, the correlation between pollutants and integrated exposure of the schoolchildren.