

# **Linking air quality data with human biomarkers measured in the Flemish Environment and Health Survey (FLEHS)**

## **SUMMARY**

To collect data on environmental contamination and related health, a five-years Flemish Environment and Health Survey (FLEHS 2002-2006, 2008-2011) for biomonitoring of residents from different geographical areas was established by the Flemish Ministries of Public Health and Environment. In the first round of 2002-2006 in total, about 4600 participants were recruited in three age groups: newborns, 14-15y boys/girls and 50-65y men/women.

In part of the populations, some of the biomarker measurements were linked with outdoor air quality data. It was an exercise in integrating both existing programmes of human biomonitoring and environmental monitoring. GPS codes of the residence place of the participants were 'layered' upon 4x4 km grids of modelled or (based-on-measurements-sites) interpolated air quality data. The averaging time for the air pollutants were chosen according to the half-life in blood or urine. Annual averages were made in case the data were linked with respiratory effects.

Blood lead and urinary cadmium levels of a group of 1600 youngsters were associated with resp. modelled lead and cadmium suspended particles levels. On the other hand, benzene and NO<sub>2</sub> levels in the home environment increased the odds of ever asthma symptoms with respectively factor 4 (per 1 µg/m<sup>3</sup> increase of benzene) and 0.3 (per 10 µg/m<sup>3</sup> increase of NO<sub>2</sub>). Loss of DNA integrity measured with the comet assay, was positively associated with benzene, B(a)P, PM<sub>2.5\_prim</sub> and PM<sub>10\_prim</sub>, indicating that the comet assay gave an idea of environmental pressure of several pollutants. There was however no association between atmospheric B(a)P and benzene levels and resp. the short-term urinary metabolites of pyrene or benzene.

From the 1196 newborns recruited, 138 subjects were followed-up during the first 3 years of life in order to study the onset of airway problems and allergy in relation to perinatal exposure to air pollutants. Cord blood contaminants were measured at birth. Exposure to outdoor air pollutants was determined for the period of pregnancy and in the first year of life. Therefore, concentrations of NO<sub>2</sub> and benzene collected by near-by measuring units, were interpolated in geographical 4x4 km grids covering the child's residence. During the first three years of the child's life, 6-monthly questionnaires on environmental tobacco smoke exposure, food, medication, pets, hygiene and airway problems were obtained. At three years of age, the children were submitted to a medical examination including skin prick test. Wheezing and coughing at 1 year of age were associated with exposure to air pollutants in the period of pregnancy or at the first year of life. The higher the concentrations of air pollutants early in life, the more the children had a chance of positive skin prick allergy tests at 3 years old.

These results point to the fact that it is interesting to integrate (existing) air quality measurements in human biomonitoring campaigns, in order to 'explain' part of the observed levels and/or health effects.