

Strategy to Evaluate Health Risks of Short-Term Exposure of Air Pollution in Vulnerable Individuals

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Abstract : Projected climate changes could lead to exacerbation of respiratory disorders associated with reduced air quality. Air pollution and climate changes influence each other through complex interactions. The poor air quality in urban and rural areas includes high levels of particulate matter (PM), ozone (O₃) and nitrogen oxides (NO_x), representing a major threat to public health and especially for the most vulnerable population strata, and especially young children. In this study, we aim to develop generic standardized policy supporting tools and methods that allow evaluating in future follow-up larger scale epidemiological studies the risks of the combined short-term effects of O₃ and PM on the cardiorespiratory system of children. We will use non-invasive indicators of airway damage/inflammation and of genetic or epigenetic variations by using urine or saliva as alternative to blood samples. Therefore, a multi-phase field study will be organized in order to assess the sensitivity and applicability of these tests in large cohorts of children during episodes of air pollution. A first test phase was planned in March 2018, not yet taking into account 'critical' pollution periods. Working with non-invasive samples, choosing the right set-up for the field work and the volunteer selection were parameters to consider, as they significantly influence the feasibility of this type of study. During this test phase, the selection of the volunteers was done in collaboration with medical doctors from the Centre for Student Assistance (CLB), by choosing a class of pre-pubertal children of 9-11 years old in a primary school in Flemish Brabant, Belgium. A questionnaire, collecting information on the health and background of children and an informed consent document were drawn up for the parents as well as a simplified cartoon-version of this document for the children. A detailed study protocol was established, giving clear information on the study objectives, the recruitment, the sample types, the medical examinations to be performed, the strategy to ensure anonymity, and finally on the sample processing. Furthermore, the protocol describes how this field study will be conducted in relation with the prevision and monitoring of air pollutants for the future phases. Potential protein, genetic and epigenetic biomarkers reflecting the respiratory function and the levels of air pollution will be measured in the collected samples using unconventional technologies. The test phase results will be used to address the most important bottlenecks before proceeding to the following phases of the study where the combined effect of O₃ and PM during pollution peaks will be examined. This feasibility study will allow identifying possible bottlenecks and providing missing scientific knowledge, necessary for the preparation, implementation and evaluation of federal policies/strategies, based on the most appropriate epidemiological studies on the health effects of air pollution. The research leading to these results has been funded by the Belgian Science Policy Office through contract No.: BR/165/PI/PMOLLUGENIX-V2.

Keywords : air pollution, biomarkers, children, field study, feasibility study, non-invasive

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