

# PMOlluGENix-V2

## Strategy to evaluate health risks of air pollution episodes in vulnerable individuals

DURATION  
15/12/2016 – 15/03/2019

BUDGET  
149 997 €

### PROJECT DESCRIPTION

Projected climate change 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 caused by anthropogenic activities includes high levels of particulate matter (PM), ozone (O<sub>3</sub>) and nitrogen oxides (NO<sub>x</sub>), representing a major threat to public health and especially for the most vulnerable population strata, including children, elderly, pregnant women and patients with heart or lung diseases.

The PMOlluGENix-V2 Pioneer project aims to develop generic standardized policy supporting tools and methods that allow evaluating in a future follow-up larger scale epidemiological study the risks of the combined effect of O<sub>3</sub> and PM during pollution episodes in children on the cardiorespiratory system by the integrative measurement of sensitive indicators of airway damage or inflammation and of genetic and epigenetic variations in non-invasive human samples (saliva and urine) as an alternative to blood samples. We will examine children (9-11 year old) in and outside polluted cities during summer and winter. A field study will allow to obtain buccal DNA and urine samples and to measure well-known lung function parameters (Forced Expiratory Volume in the first second (FEV<sub>1</sub>), exhaled NO) in children exposed to pollution irritants (PM<sub>10</sub>, PM<sub>2.5</sub>, NO<sub>2</sub>, Black carbon (BC)). The pollution episodes will be selected via IRCEL-CELINE forecast but the pollutants will also be measured via on-site continuous monitoring. Potential new epigenetic biomarkers of air pollution will be explored and compared in the urine and saliva by measuring the methylation level of a gene promoter and miRNA. To measure protein biomarkers, the use of the cost-effective high-throughput MRM-technology (Multiple Reaction Monitoring) will be validated and compared with the results obtained using the classical immunological tests. At last, the effect of how genetics influence the responses to O<sub>3</sub> and PM regarding respiratory parameters, will be assessed by using genomic DNA (gDNA) extracted from buccal cells and urine originated from the field study and an already existing Biobank containing samples of 334 children exposed to various levels of PM and O<sub>3</sub>. Therefore, this study will integrate proteinaceous, genetic and epigenetic aspects in order to optimize the use of potential health biomarkers. These results will be compared to epidemiological observations linked with critical values of pollution with the goal to provide a quantification of the health impact.

To conduct this study, an unprecedented interdisciplinary collaboration was set-up at the Belgian level. This consortium includes, firstly, expertise from the Scientific Institute of Public Health (WIV-ISP) from the Platform of Biotechnology and Molecular Biology, from the Service Health and Environment and from the service of Epidemiology and Infectious diseases. Secondly, the consortium consists of two national universities, i.e. the Louvain Centre for Toxicology and Applied Pharmacology department (LTAP, UCL) and the Centre for Environmental Sciences, Molecular & environmental Epidemiology (UHasselt). Thirdly, the collaboration with the Flemish Environment Agency (VMM) will allow accurate on-site pollution measurements.



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The project will deliver significant results and explore research paths that are beyond the state-of-the-art in the field of studying the impact of air pollution on health. This pioneer research is also responding to practical needs by allowing to identify possible bottlenecks and to provide missing scientific knowledge, necessary for the preparation and implementation of large scale epidemiological studies and of federal policies concerning the effect of O3 and PM on health.

The results of the study will be integrated and discussed in order to evaluate the feasibility of the different sampling/technologies/biomarkers approaches for a large scale epidemiological study on children. In parallel, the obtained results will be compared to epidemiological observations during the pollution episodes and will serve to design the best epidemiological study including human sampling with the goal to provide a quantification of the health impact during the pollution episodes. The feasibility study will also include additional modifications to be made to be able to target other vulnerable groups like elderly, pregnant women and patients with heart or lung diseases. Discussion will happen through reports transmission followed by discussion during a workshop with the international partner, the different partners of this project and the stakeholders. In addition, the project results will be published in peer-review scientific journals.

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## LINKS

<https://www.wiv-isp.be/en>