Title: Enhanced Exposure assessment and omic profiling for high priority environmental exposures in Europe

Instrument: FP7 Collaborative Project

Total Cost: 11.428.580 €

EC Contribution: 8.748.628 €

Duration: 48 months

Start Date: 01/11/2012

Consortium: 12 partners from 7 countries

Project Coordinator: Imperial College London (GB)

Project Web Site: www.exposomicsproject.eu

Key Words: exposome, cancer, biomarkers, omics, environmental exposure, disease risks modeling, sensors and smart phones, molecular epidemiology

THE CHALLENGE

Rapid growth in global economies has led to increasing volumes of chemicals produced as well as growing numbers of new molecules. The European Inventory of Existing Commercial Chemical Substances (EINECS) has estimated that of the 100,000 chemicals on its inventory, around 80,000 are currently in use in EU countries; and about 2,000-3,000 new chemicals are introduced per year. In 2010, EU's chemical production was 339 million tones.

In spite of this, there are incomplete preventive measures due to the lack of international coordination and control, and to the transfer of exposures through export and international transport.

The search for the relationships between external exposures, (*as measured by Personal Exposure Monitoring which has not previously been used in large scale studies*), and global profiles of molecular features (*as measured by omics*) in the same individuals constitutes a novel advancement towards the development of "next generation exposure assessment" for environmental chemicals and their mixtures. The linkage with disease risks opens the way to what are defined here as *'exposome-wide association studies' (EWAS)*. By comprehensively addressing, for the first time, the integration of the external and the internal components of the exposome at the individual level, EXPOsOMICS provides a holistic and consolidated approach to exposure science.

PROJECT OBJECTIVES

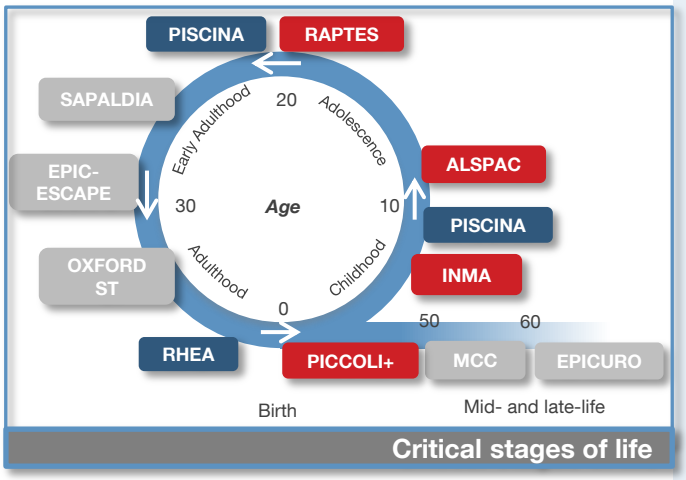
EXPOsOMICS aims to develop a novel approach to the assessment of exposure by characterizing the external and the internal components of the exposome, focusing on air and water contaminants during critical periods of life. To this end, the project will centre on the following:

- exposure assessment at the personal and population levels within existing European short- and long-term population studies, exploiting state-of-the-art methods for personal exposure monitoring (PEM) (e.g. portable sensors, smart phone-based technologies);
- multiple "omic" technologies for the analysis of biological samples (internal markers of external exposures, including metabolomics, adductomics and epigenomics).

METHODOLOGY

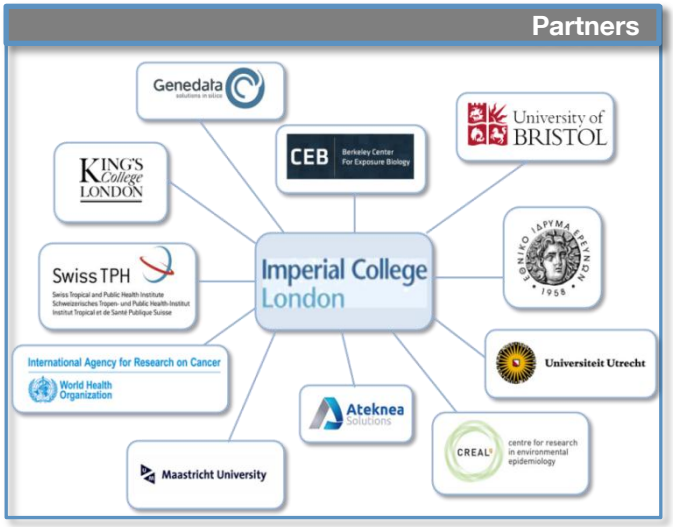
Building upon several EU-funded research projects with rich sets of health and exposure data, biomarker measurements and publicly available data sources, this multidisciplinary project will:

1. Pool and integrate information from short-term, experimental human studies and existing long-term epidemiological cohorts/consortia - including adults, children and newborns - to design focused investigations for the refinement of environmental exposure assessment based on the concept of life-course epidemiology.
2. Characterize the exposome, by (a) measuring the external component of the exposome at different critical life stages with high-technology tools, exploiting experience gained in existing EU initiatives (sensors, databases coupled with GIS, remote sensing, black carbon particles, reactive oxygen species, and disinfection by-products), with a focus on air and water pollution; and (b) measuring internal biomarkers of the exposome (xenobiotics and metabolites, adductome, metabolome, transcriptome, epigenome, proteome) with up-to-date omic technologies.
3. Use the above exposome measurements to model exposure to air pollution and water contamination in large population studies, through novel statistical modeling.



PARTNERS

There are 12 institutions from 7 countries participating in this project.



EXPECTED RESULTS

The ultimate goal of EXPOsOMICS is to reduce uncertainties in risk assessment and in estimating burdens of disease.

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