

A new technology to track down air pollutant effects

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Did you ever see pollution level indicators displayed in big European cities? The EXPOSOMICS project is looking to make them obsolete. Not only will their technology determine the exact impact of pollutant exposure on our health, but it could eventually land in your pocket - as a smartphone app.

The urbanisation process, combined with high reliance on polluting transport solutions, has had a tangible effect on the air we breathe. Whilst the vision of European pedestrians wearing masks just like in some Asian megalopolis still seems unlikely for most of us, alarming signs like fog alerts have made citizens increasingly curious about their exposure to pollutants and the effect it has on their health. But are the current measurement methods good enough to inform them correctly?

Launched in November 2012, the EXPOSOMICS ('Enhanced exposure assessment and omic profiling for high priority environmental exposures in Europe') project was born from the observation that there is no standard or systematic way to measure the influence of environmental exposures on our health. Building on multiple 'omic' techniques, their technology will collect exposure data focusing on air pollution and water contaminants for each individual, which could then be linked to biochemical and molecular changes in the body causing acute and chronic diseases. It will rely upon sensors, smartphones, geo-referencing and satellites to create a 'Personal exposure monitoring' (PEM) system, which will ultimately help scientists estimate the burden of environment-related disease.

The EXPOSOMICS measurement methods will be tested both in experimental short-term studies and long-term longitudinal studies on epidemiological cohorts of adults, children and newborns. Thanks to its two partner SMEs - one specialised in sensors and smartphone development, the other in complex data integration - the project hopes to leave its mark on European public health over the long term.

Prof. Paolo Vineis, leading researcher in the field of molecular epidemiology at Imperial College London and coordinator of EXPOSOMICS, was recently interviewed by the *research*eu* magazine. He details the progress of the project so far, its expected benefits and the next steps for his research.

What are the main objectives of the project?

The project aims at overcoming limitations of current exposure assessment approaches used in epidemiology. EXPOSOMICS will use two complementary approaches. First, we will perform PEM with specially-designed equipment, to improve the estimation of exposure to [air pollutants](#) for hundreds of volunteers; second, we will apply the newly developed 'omic' technologies to monitor - alongside PEM - early changes in body molecules (DNA, RNA, proteins, metabolites).

What is new or innovative about the project and the way it measures exposure to contaminants?

The large scale of deployment of PEM (in hundreds of subjects) and the use of such improved measurements to estimate exposure in epidemiological studies are the main novelties. Then comes the 'agnostic' use of omics (that is, without a priori hypothesis) to study early health effects. The latter approach can lead to innovative discoveries on the relationships between the environment and health.

What first drew you to research in this area?

I have been working in [environmental health](#) for many years and I was dissatisfied with the tools we had to measure exposures and their early effects. Also, I came across influential people like Chris Wild, Steve Rappaport and Martyn Smith who have developed the concept of exposome, which is conceptually very attractive although we still need to provide sound proof-of-principle.

What were the main difficulties you faced and how did you solve them?

The main difficulties are to coordinate so many partners in different fields (exposure assessment, laboratory, epidemiology), and obtain validation of the laboratory results, i.e. reliable measurements with relatively limited technical error.

What are the next steps for the project?

We have already collected exposure data from several hundred subjects. The next step is to measure omics as soon as possible and perform statistical analyses to see whether the two types of data provide useful information. A very exciting period ahead!

How do you expect this technology to benefit EU citizens?

We aim at clarifying whether the current 'acceptable levels of [environmental exposures](#)' are really safe. We published two papers last year (in *Lancet* and *Lancet Oncology*) showing that there is an excess of deaths and lung cancer at levels of [exposure](#) to air pollutants lower than

the current European standards. We hope that a more sensitive approach like the one we use in EXPOSOMICS will contribute to further clarifying this issue.

One of the project deliverables is the use of smartphones to gather data on exposure. How will this work concretely?

Smartphones are used for three purposes: to integrate data coming from the different measurement instruments, to locate people geographically and follow their movements, and to measure physical exercise in addition to the accelerometer.

When do you expect the EXPOSOMICS technology to be commercialised, with an app for people to access the data you collect?

We are not sure. The PEM devices are still too big and heavy to be used in everyday life, but our partner SME is working to improve them. Bluetooth 4 technology will boost the creation of smaller sensors, which means they will be easier for people to carry.

Our partner will have an app commercialised sooner or later, but we are still far from that goal: the current version of the app is being validated in different studies (EXPOSOMICS, HELIX and CITISENSE) and, before it goes to market, our partner will be adding new features such as indoor location and real-time online monitoring.

More information: www.exposomicsproject.eu/

Provided by CORDIS

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