EXPOsOMICS has received funding from the European Union's Seventh Framework Program under grant agreement No. 308610

Newsletter

Issue 1 | October 2013

WELCOME



We are glad to launch the very first EXPOsOMICS Newsletter. We hope this bi-annual electronic newsletter will provide an inspiring space to exchange scientific results, ideas, and opinions. We aim to provide regular updates about the progress, challenge and results of the project and also share the values throughout the duration of this collaborative project.

We warmly invite you to contribute to future newsletters by either sending us articles illustrating any important aspects of your research or by simply sharing your thoughts on the project.

In this first issue, Professor Stephen Rappaport from UC Berkeley shares his personal view about his work and how the 'Exposome' could help people live longer and healthier lives.

The newsletter also includes an update on the progress of personal monitoring exposure (PEM) and the related workshop, press appearance and important publications as well as information on EXPOsOMICS related projects from around the world.

Professor Paolo Vineis
Project Co-ordinator, Imperial College London

Veronique Terrasse and Dr Helga E Laszlo
IARC Imperial College London

Interview with Prof. Stephen Rappaport

Stephen Rappaport is a pioneer in the emerging field of 'Exposure Biology' and a strong proponent of the concept of the 'Exposome' as a new paradigm for environmental health. Prof Rappaport is Director of the Berkeley Center for Exposure Biology at the University of California, Berkeley. Much of his current research involves the development and application of blood protein adducts as biomarkers of exposure to toxic chemicals arising from inhalation, ingestion, and endogenous processes. For the Exposomics project he is working on the adductomics work package, WP6 together with David Phillips from Kings' College, London. Veronique interviewed him about the exposome concept and the importance of elucidating exposures that cause chronic diseases.

Below is a short version of the interview. The full version can be downloaded from here.

How do you define the concept of exposome and how does it complement the genome?

We think of the exposome as the totality of exposures that might contribute to disease. Since it is widely accepted that diseases are caused by the combined effects of genetic factors and exposures, the exposome is a natural complement to the genome in epidemiologic research. By comparing both exposomes and genomes between diseased and healthy people it is possible to find those exposures and genes (or their combination) that are causal factors.

Stephen pointed out that not only the external but the internal (microbiotic) environment is important.

Could you give some examples of effects of the microbiota?

Although research into the health effects of the microbiota is relatively new, some interesting disease associations are emerging. For example, studies have shown that babies delivered by caesarean have different populations of microbiota than babies delivered vaginally. Other studies have shown that metabolism of common nutrients by some microbiota produce undesirable chemicals, like trimethylamine, that appear to be associated with chronic diseases.

Why is it important of elucidate the constituents of the exposome that cause diseases?

The accumulated evidence shows that the genes have a relatively small influence on the incidence of chronic diseases. If we want to find out what accounts for 85% - 90% of chronic-disease risks, we need to move away from the genome and investigate the non-genetic causes, that is, the exposome. This is why Chris Wild originally proposed the idea of the exposome in 2005.

How can you characterize all exposures that might cause diseases?

This can be done using samples of blood. Although it has become rather routine to characterize virtually all genes in such samples using genome-wide-association studies (GWAS), relatively little attention has been paid to parallel evaluations of the exposures, i.e. exposome-wide-association studies (EWAS). A promising approach for performing EWAS involves measuring all small molecules in blood – some people refer to this as untargeted metabolomics - and it is now possible to detect more than 30,000 small molecules in a single blood specimen. This collection of small molecules includes contributions from all external and internal sources – food, endogenous processes,

Project progress

cont. Interview with Prof Stephen Rappaport

microbiota, drugs, pollution and lifestyle factors – and thus gives us a rather complete view of exposure. Other classes of chemicals, including metals, proteins and foreign DNA and RNA, can also be investigated in a complementary fashion.

What exposures will your project (adductomics) investigate?

In WP6 we are investigating a particular class of molecules called reactive electrophiles that result from metabolism of foods and pollutants, oxidation of lipids and other endogenous processes. These molecules cannot be measured directly in blood so we are measuring products of their reactions with human serum albumin, which is major blood protein. These reaction products are termed 'adducts' (chemical shorthand for 'addition products') and - because we are looking at the totality of adducts at a particular reaction site in the albumin molecule - we refer to the methodology as 'adductomics'. We will use adductomics to investigate exposures to reactive electrophiles arising from both pollution and dietary sources using blood obtained by other work packages in the Exposomics project.

How important is the concept of the 'Exposome' for you and what impact do you expect to see?

Now we can use the umbrella of the exposome to develop and apply new methods to characterize all bioactive chemicals in the body and – through EWAS - to pinpoint those that cause disease. I trust that the Exposomics programme will find some of these chemicals, whether they originate from the diet, microbiota, pollution or other sources. Once we discover these discriminating exposures, we can help people live longer and healthier lives. That would be very cool.

Prof Stephen Rappaport (UC Berkeley)
Veronique Terrasse (IARC)

Project progress

In the following section we aim to give an overview of activities and results from inside and outside of the EXPOsOMICS project.

Dr Helga Elvira Laszlo
Imperial College London

Website

The project website is now live. We use this platform as one of the main communication channels where we post regular updates, the latest publications and news.

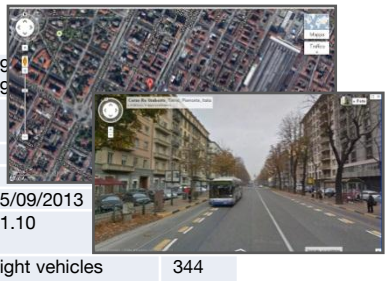
The document and presentation templates will be made available from the 'Members' area. For registration or other website related matters please contact Helga E Laszlo (h.laszlo@imperial.ac.uk). Suggestions on website content are welcome!

SEVENTH FRAMEWORK PROGRAMME

Project progress

Personal Exposure Monitoring

The PEM (personal exposure monitoring) has started or is about to start in 5 European areas (Basel, Torino, Utrecht, Barcelona and East Anglia). All of these involve adults except the INMA study in Barcelona. Overall 200 volunteers will participate for three rounds of 24 hours each. The complete PEM campaign will last one year. Sites (residences of the volunteers) have been chosen carefully based on a review of different potential sites (Fig 1).



GPS Coordinates	39 49	
Floor of the apartment	2	
Traffic impacts :		
Date	25/09/2013	
Starting time of count	11.10	
Nearest Street 22.000	Light vehicles	344
	Heavy vehicles	4
	Mopeds	36
	Buses	11

Fig 1. Some details collected about the selected sites

A very detailed manual for the conduct of PEMs has been prepared and strict criteria for inclusion of volunteers have been developed. Volunteers will carry a backpack (Fig 3). In some places (e.g. Torino) a scientific presentation was organized followed by a party with the volunteers (Fig 2).

Fig 2. Presentation in Torino

The Ateknea (previously CRIC) Team has been working to improve and test the PEM software applications. ExpoApp (the smartphone app) and SensorLab (the PC application) have been validated by CREAL and UU.

The has been started on developing the next version of the application that may include indoor location application (at room level) and support for Bluetooth sensors on ExpoApp like heart rate monitors.

Utrecht workshop

On 3-4 September, 2013 a Technician Workshop was organised in Utrecht for project partners carrying out the PEM measurements in order o demonstrate the equipment in the PEM backpack and its usage (Fig 3). For further information please contact Dr John Gulliver (j.gulliver@imperial.ac.uk).

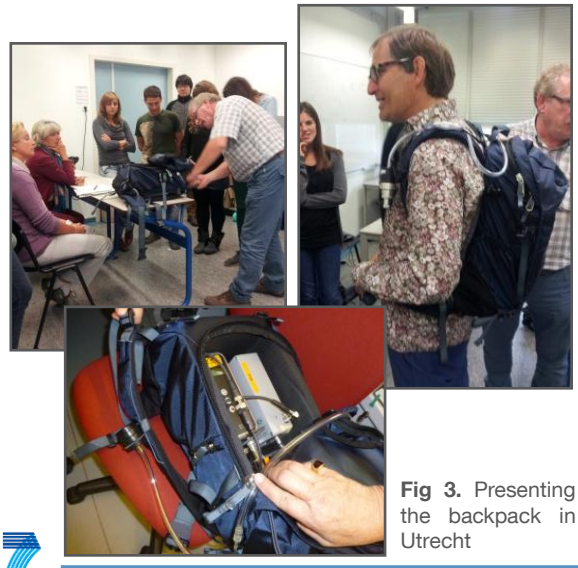


Fig 3. Presenting the backpack in Utrecht

SEVENTH FRAMEWORK PROGRAMME

Project progress

Press coverage

In the last couple of months the project was highlighted and discussed in various press and digital media.

- The Oxford Street Study, one of the 14 studies utilised in the EXPOsOMICS project, has been highlighted in the front page of Imperial College London. Click here for the full article.
- As part of the European Educational Programme in Epidemiology, a five day course was organised in Florence, Italy between 17-21 June 2013 around the field of exposomics. Several project partners including Prof Paolo Vineis, Prof Stephen Rappaport or Dr Augustin Scalbert gave presentations. Their talks can be downloaded from the EXPOsOMICS website.
- Prof Paolo Vineis, Prof David Phillips and other partners were interviewed by Al Jazeera on EXPOsOMICS. Follow the link to see The Cure- Series 2 - Episode 3: Disease Mapping.

Publications

The latest project related publications can be found on the project website.

Environmental and Molecular Mutagenesis has recently published a special issue on Application of Omics Techniques to Epidemiological Studies. Follow the link to read the content.

Exposome in the world

HELIX BUILDING THE EARLY-LIFE EXPOSOME

The project will exploit novel tools and methods, including omics and smartphone-based personal exposure monitoring, to characterise early-life exposure to a wide range of environmental hazards, and integrate these with data on major child health outcomes.

HEALS

The general objective of the HEALS project is the refinement of an integrated methodology and the application of the corresponding analytical and computational tools for performing environment-wide association studies in support of EU-wide environment and health assessments.

Upcoming events

The first annual project meeting takes place at South Kensington Campus, Imperial College London, UK on 14-15 November 2013. The agenda is available from the 'Members area'. More than 40 members from the 12 project partners attend the meeting.

Important update

From 5 August 2013 Centre de Recerca i Innovació de Catalunya S.A. (CRIC) operates under the new company name that is Ateknea Solutions.

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