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

Newsletter

Issue 3 | May 2016

EDITORIAL

Welcome to the third Exposomics newsletter!

We are now in the final year of the project, with some very exciting work ahead.

Over the past year, the project moved at a fast pace. A number of key meetings were held towards the end of last year to help the planning process for the final period. A very successful Exposomics & HELIX stakeholder joint webinar was held in December 2015. The webinar provided an overview of the project findings and objectives, as well a great opportunity for stakeholders to get actively engaged in discussions on the role of exposome research in informing policy development.

In this edition of the newsletter, we provide an overview of the progress of various working groups that are part of the project. Dr. Michelle Plusquin (ICL) and Dr. David Phillips (KCL) talk about the progress of their work and its importance for the project.

You will also find a summary of progress on data gathering and status of the Exposomics FTP server, which will be the project's database.

Enjoy the next few pages and please get in touch if you have exciting news to share in the next edition!

The Exposomics Team

Meeting Updates

15 Sep 2015
The Project Review Meeting covered a series of updates. The Exposomics and Helix projects were reviewed by the European Commission.

19-20 Oct 2015
The Consortium Meeting discussed upcoming deadlines, timing and priorities for the project. The meeting also highlighted the Exposomics database, created by GeneData, and an update on the database structure and accessibility was provided to the Partners.

2 Dec 2015
PSB In-Person Meeting Utrecht reviewed work package progress for all remaining deliverables and a plan or the last year of the project was done. A database status update was provided and agreements were made with regards to timelines for the laboratories to send the data to the Exposomics server.

18 Mar 2016
PSB In-person meeting London focused on the status of the data (cohorts and laboratory analyses) for the various project studies and their storage on the Exposomics FTP server.

Exposomics - Brief project overview

The Exposomics project aims to predict individual disease risk related to the environment, by characterizing the external and internal exposome for common exposures (air and drinking water contaminants) during critical periods of life, including in utero.

A large amount of health data is now available from longitudinal cohorts in both children and adults, with detailed information on risk factors, confounders and outcomes, but these are not well linked with environmental exposure data. The exposome concept refers to the totality of environmental exposures from conception onwards, and is a novel approach to studying the role of the environment in human disease.

This project will move the field forward by utilising data on individual external exposome (including sensors, smartphones, geo-referencing, satellites), and omic profiles in an agnostic search for new and integrated biomarkers. These tools will be applied in both experimental short-term studies and long-term longitudinal studies in humans. The ultimate goal is to use the new tools in risk assessment and in the estimation of the burden of environmental disease.

This multidisciplinary proposal combines:

- **development of a general framework** for the systematic measurement of the internal and external exposome in Europe in relation to air and water contamination, as a way to reduce uncertainty in risk assessment and to address the effects of mixtures and complex exposures;

- **evaluation of health outcomes** and key physiological changes in short-term studies (including a randomized trial) and life-course studies with a large amount of information on diet, physical activity and anthropometry;

- **evaluation of the burden of disease** in the European population, based on state-of-the-art assessment of population exposures.

For additional information on the project please follow the link to the project website:

http://www.exposomicsproject.eu/

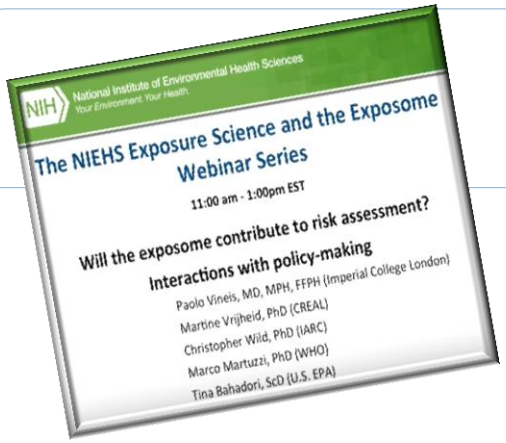
News and events related to the project can be accessed via the following links:

http://www.exposomicsproject.eu/events

http://www.exposomicsproject.eu/news

Relevant articles and publications by Exposomics Partners can be accessed via:

http://www.exposomicsproject.eu/publication-resources



The NIEHS Exposure Science and the Exposome Webinar series

(an Exposomics & Helix joint workshop)

In mid-2015, the Coordination teams of the Exposomics and HELIX Projects took a decision to replace the Intermediate workshop on the progress of the projects with stakeholders, with a webinar for stakeholders on progress up. The proposed change received the approval of the European Commission in September 2015.The following description summarises the stakeholder event held in December 2015.

As part of this WP a webinar entitled "**Will the exposome contribute to risk assessment? Interactions with policy-making**" was jointly organised with the HELIX project, a related consortium on the study of the early-life exposome funded by the European Commission FP7.

The purpose was to promote the dialogue between the teams of both projects, the groups of stakeholders and members of the public on the role of exposome research in informing policy development, in particular on the process for translation of the growing body of results from research on the exposome into risk assessments, regulations and policy by national and international agencies.

The webinar was held on the 9 December 2015 at 17:00 CET, hosted in the NIEHS Webcast Platform as part of the "NIEHS Exposure Science and the Exposome WebinarSeries".

Stakeholders who were unable to attend the session were invited to view the recorded presentations and discussion.

The webinar was structured in four sessions of 20 min each presented by senior scientists from the EXPOsOMICS and HELIX projects as well as by stakeholders in exposome science and policy, followed by a general discussion where the presenters answered questions submitted by the audience.

The organisers and the speakers received very positive feedback on the webinar and numerous requests for copies of the presentations, including from a US National Academy of Sciences committee on Tox21 which met to discuss the policy implications of the exposome.

A recording of the webcast was subsequently posted online on the NIEHS Webinar Series channel and can be viewed by clicking here.

Eduardo Seleiro (IARC)
Terrence Simmons (ICL)

Webinar agenda:

Introduction - EXPOsOMICS project, objectives and findings
Paolo Vineis, Imperial College, London

HELIX project, objectives and findings
Martine Vrijheid, CREAL, Barcelona

Relevance of Exposome research for policy
Chris Wild, International Agency for Research on Cancer, Lyon

What policy needs and expects from the Exposome science
Marco Martuzzi, WHO, and Tina Bahadori, US EPA

Discussion and questions

Interview with Dr Michelle Plusquin

Understanding exposure to air pollution in children and adults

Michelle Plusquin is Research fellow at Imperial College London. Her research topics are Epigenetics and air pollution. Michelle is working on the ALSPAC cohort that involves children. She studies the molecular mechanisms that reflect how health is affected by exposure to air pollution in children and adults in order to better understand the mechanism at different molecular levels including at epigenetics and metabolomics levels.

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Can you please tell us more about this study on children?

Children are a sensitive population, they are more susceptible than adults to environmental exposures and they are developing. EXPOSOMICS combines the data of 5 well-documented birth cohorts being ALSPAC, ENVIRONAGE, INMA, PICCOLI+ and RHEA. For the children in the study we have information about air pollution exposure of the mothers during pregnancy and can study how increased exposure in the womb leads to effects on asthma, growth and neuro-cognition later in life.

At what stage of the study are you at the moment?

The ALSPAC study is slightly ahead of the 4 other cohorts since the data is already available. This study is well-known and it started in the 90's in the UK.
It includes 15,000 children, many have been followed-up for over 20 years therefore it provides a lot of information.

One of the main focuses in ALSPAC is to better understand how biomolecules are changed by exposure to air pollution and explain how air pollution causes asthma. At the moment we are analysing the epigenetics and metabolomics data. In the next months we can hopefully report interesting findings. The data of the other children studies is being generated at the moment.

Interview with Dr. Michelle Plusquin

Part of the study concerns adults, do you have results already?

In order to tackle life course mechanisms, we looked into effects on adults and children. We observed that increased exposure to NO2 and NOx can lead to less methylation of the genome and we identified functional regions on the DNA that drive this response. One hypothesis is that this might be a mechanism that can enable the development of cancers. Methylation of the complete DNA strand is involved in genome stability, and one hallmark of cancer is having less genome stability.

What has been the most interesting aspect of your work?

We want to identify signatures of DNA methylation that are induced by exposure to air pollution and we need to figure out how this specific signature can lead to a certain outcome. One aspect of the work is analysing the data and reporting the significant results, but interpreting and finding a biologically and plausible explanation is for me the most interesting part of a study. The results that are revealed regarding mechanisms or diseases caused by air pollution generate a better understanding of the exposure and will be of interest to the public health.

Veronique Terasse (IARC)

Interview with Dr David Phillips

Adductomics technology & Exposomics

David Phillips is a Professor of Environmental Carcinogenesis, Department of Analytical & Environmental Sciences, Kings College London. He leads WP6 and conducts analysis of protein adducts (adductomics) and is an expert in Human biomonitoring and carcinogen activation.

In a few words, please describe what is Adductomics?

Adductomics is the detection of modifications to cellular macromolecules (DNA and protein) by reactive species that can be of environmental (exogenous) or physiological (endogenous) origin. They are an indication that the organism has been exposed to reactive metabolites of potentially harmful agents. They are therefore biomarkers of exposure and can also be biomarkers of disease risk. In the Exposomics project we are focusing on adducts (the word is a shortening of ADDition prodUCTS) in albumin, a protein that is abundant in human serum, a material that is in reasonably plentiful supply from biobanks.

How are the results important to the Exposomics project and what does it brings to the project?

This is a relatively new method in the omics field. As an untargeted approach, it may reveal profiles that are characteristic of environmental exposure to harmful agents and/or identify profiles associated with disease states (eg. asthma, COPD). This may lead to targeted identification of the species responsible for the adducts, thereby shedding light on the mechanism(s) of disease.

How far are you in the project?

At present we have developed the protein assay to the point where it is suitable for high throughput, and we have validated it for consistency and reproducibility with human samples. We have carried out analyses of several of the Exposomics sample sets (e.g. PISCINA, TAPAS, Oxford Street2) and the results are being processed prior to investigating the results for exposure-related and disease-related components.

What are some of the challenges that you are facing?

It has been a challenge to both develop the methodology and to apply it to the Exposomics samples, since this was not an assay that was established and ready to use at the start of the project. The assay has now reached the stage where we will begin to see how sensitive it is and whether it will be able to detect difference between individuals that correlate with the exposure scenarios that they have had.

What are the next steps?

We are pressing ahead with completing the planned analysis of the Exposomics samples, so that results can be compared also with the other omics measurement being made.

Michaela Dijmarescu (ICL)

LATEST NEWS

Exposomics Achievements Session – UKEMS Jun 2016

- **UK Molecular Epidemiology Group Session – Exposomics:**
  Dedicated session highlighting achievements of the project at UKEMS 2016 Conference at King's College London, 26-29th June 2016. Speakers include: Nicole Probst – Hensch, Switzerland, Paolo Vineis, John Gulliver & George Preston, London, Augustin Scalbert, France, Cristina Villanueva, Spain and Jos Kleinjans, Netherlands.

Upcoming Workshops & Conferences

- **EU FP7 Exposomics/ Helix/ Heals Statistical Meeting:** Held at Imperial College London, St. Mary's Campus on Wed, 25th May 2016 and lead by. Marc Chadeau-Hyam, Lecturer in Statistical Bioinformatics, Imperial College London.
- **Molecular Epidemiology of Chronic Disease and the Exposome :** Workshop held in Utrecht between 13-17 Jun 2016 and led by Roel Vermeulen and Jelle Vlaanderen.
- **The Exposome: from concept to practice:** Post-conference workshop held at ISEE Symposia on the 4th September 2016, Rome. Organizers are: David Balshaw, National Institute of Environmental Health Sciences, USA, Roel Vermeulen IRAS, Utrecht and Paolo Vineis, Imperial College London.
- **The Exposome and occupational health:** Symposia at EPICOH/X in Barcelona, Spain, 4-7 September 2016, chair Roel Vermeulen. The statistical session will use some of the simulation work within Exposomics as an example.
- **The Exposome: from concept to practice:** Full day programme on the Exposome at the ISES Utrecht in October 2016. Roel Vermeulen and Marc Chadeau from Exposomics will facilitate the session, amongst other representatives for both Exposomics and Helix.

Past Events

- **The role of the 'omics-technologies' in Human Biomionitoring, current and future applications:**
  Presentation done by Paolo Vineis, Imperial College London at the HBM Conference Berlin, 19th April 2016;
- **The impact of short term exposure to disinfection by-products on the metabolome – a metabolome-wide association study:**
  Presentation by Karin van Veldhoven at the OEEC (Occupational & Environmental Epidemiology Conference) 21st April 2016, Buxton, UK.

CONTACT US

Principal Investigator
Professor Paolo Vineis
Imperial College London
MRC_PHE Centre for Environment and Health
School of Public Health
St. Mary's Campus, Norfolk Place
LONDON W2 1PG
Telephone: +44 (0)20 75943372
Email p.vineis@imperial.ac.uk