



D1.1 – National Nodes Report
**WP1 – Scientific Vision & Technical
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Responsible Author	Shachar Dvir			
	e-mail	shachar.dvir@recetox.muni.cz	Phone	+420776101267
Other Authors	All participants			

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INTRODUCTION

The European Strategy Forum on Research Infrastructures (ESFRI) has included EIRENE RI (Research Infrastructure for Environmental Exposure Assessment in Europe) on its roadmap as a future Research Infrastructure whose main objective is to support exposome research in Europe (a topic not covered by other European infrastructures). The exposome concept encourages the systematic and comprehensive measurement of environmental exposures (i.e., non-genetic factors) experienced by an individual to understand the influence of the environment on phenotype and health. It considers exposures from sources such as diet, lifestyle, and the environment and can be measured both in the environment (external component of the exposome) and in the body (internal component of the exposome). The EIRENE Preparatory Phase Project (EIRENE PPP) is funded as part of DG RTD's Horizon Europe program (Grant Agreement No. 101079789) as a first step towards the creation of a European Research Infrastructure Consortium (ERIC) within approximately five years. EIRENE will bring together existing national research infrastructures from across Europe and the USA to form a transnational distributed research infrastructure in the exposome field.

The mission of EIRENE RI is to establish and maintain a world-class research infrastructure dedicated to the advancement of exposome research, with the ultimate aim of contributing to the enhancement of human health on a global scale.

The National Nodes Report provides an overview of the composition and structure of EIRENE members. EIRENE currently has 21 members, including four new members (Cyprus, Denmark, Luxembourg, and Portugal) who joined in late 2023.

EIRENE consortium members offer a wide and diverse set of services. The stages of development across the members and between institutions in member countries differ significantly. While some offer services, others are only beginning to develop their capacities. There are also large differences in political and financial support. Financial support is, in some cases, coupled with inclusion into national research infrastructure roadmaps. Some countries do not have roadmaps at all, while in others the roadmaps do not include funding. Since the roadmaps are usually updated only every several years, newer members still have not had a chance to submit applications to join.

This report is extremely important in informing about EIRENE both internally and externally. It is the basis for understanding the structure and activities of EIRENE.

The services and facilities are briefly mentioned as a comprehensive list is currently being collected and analyzed (and reported in D2.1 – List of EIRENE Core Services) and will be included in future updates of the report.

The EIRENE consortium includes 20 European countries and the USA. In the future, EIRENE intends to expand its reach to other continents. Since it is currently the only large research infrastructure worldwide focusing on Exposome research, it hopes to attract all the major actors in the field from across the globe. A major step in that direction is through the International Human Exposome Network (IHEN) project. IHEN is coordinated by EIRENE members from Utrecht University and ISGlobal. Its main objective is „to design an International Human Exposome Network that will serve

to strengthen cooperation and coordination of exposome research in Europe and foster and align cooperation globally.”

While the report is extensive, it is not comprehensive, as not all national nodes provided information. While most of the members provided very detailed information, several national nodes, mainly the new members, did not provide any information, while several others provided very limited information. Since the report is a living document, it will be periodically updated to reflect changes.

COUNTRY PROFILES

INTRODUCTION

The National Node of pan-European Research Infrastructure EIRENE, Exposome Austria (EA), was officially established at the University of Vienna (UNIVIE) in January 2022 and involves three other partner institutions: Medical University of Vienna (MUW), Medical University of Innsbruck (MUI), and the Environment Agency Austria (EAA). The formation of EA goes back to the Autumn of 2019 and is based on the Austrian Human-Biomonitoring Platform, which had been operating successfully since 2007 and, in 2016, became an advisory body to the minister of the environment and regularly reports to the National Council of the Austrian parliament (demonstrating the high importance of innovative biomonitoring and exposome initiatives in the Austrian scientific landscape).

National Node Contact Point

- [Benedikt Warth](#)
- Benedikt.warth@univie.at

Within EA, two 'Open Lab' infrastructures at the University of Vienna and the Medical University of Innsbruck are intended to be established in close cooperation with existing mass spectrometry core facilities. In addition, the analytical facilities at the Environment Agency Austria, while not intended to be fully open, are part of the Austrian EIRENE strategy. These centers of excellence for measuring the chemical exposure of population groups examine urine, blood, umbilical cord blood, breast milk, or placental tissue, as well as other environmental samples, applying innovative targeted and non-targeted analytical methods. In addition to the exposure, the biological effects triggered by chemical exposures might be investigated holistically and systematically.

RESEARCH FOCUS

In accordance with the Austrian proposal submitted in March 2020 to the Federal Ministry of Education, Science and Research (BMBWF), which received political support, **EA focuses on the establishment of innovative mass spectrometry-based analytical services.** This is especially true during the preparatory phase of EIRENE (2022-2026).

These services should, in the long term, support the following **three research areas of high national priority**:

1. Analytical method development

Three of the involved institutions (UNIVIE, EAA, MUI) have high-end analytical instrumentation and unique expertise in exposure-related research. This includes targeted HBM of chemicals relevant for environment and food safety such as perfluorinated substances ('PFOS/PFOA'), bisphenols ('BPA'), phthalates, pesticides, mycotoxins, phytochemicals, heavy metals, and pharmaceutical compounds. A major priority of the Austrian partners will be the highly innovative

area of non-targeted screening (NTS), an approach in which high-resolution mass spectrometry allows for the detection of contaminants, toxins and other xenobiotics without any a priori knowledge. NTS techniques and workflows are available in the laboratories of UNIVIE, EAA, and MUI. An important aspect will be the development of tandem mass spectral libraries and their linkage with tailored bioinformatic tools for the (semi-)automated evaluation of the generated big data.

2. Early-life chemical exposome and its impact on health and disease

It has been suggested that chemical exposure during early life (in utero and until adolescence) heavily impacts later life health outcomes. This is specifically relevant in the case of neurobehavioral and developmental disorders, whose prevalence is increasing. Also, some of the most relevant diseases challenging our aging society, including many cancers and neurodegenerative diseases such as Alzheimer's and Parkinson's, are often attributed to environmental exposure during early life, though still elusive. Based on this great need and the solid foundation established via successful projects in the past, EA will focus on early-life exposure assessment. The research enabled by the RI will, therefore, mostly involve (i) placental research for investigating in-utero exposure and metabolism, (ii) exposure in mother-infant pairs, and (iii) the comprehensive assessment of chemical exposure in Austrian infants and children. As early life exposure is of utmost importance for the development of a broad spectrum of diseases, potent efforts will be undertaken to identify and minimize the contaminants as well as the burden of disease.

3. Austrian biobank for assessing exposures during early life and precision prevention

Samples obtained within the ongoing projects (funded by third parties or the respective research institutions) are intended to be the basis for the first Austrian biobank focusing on early life exposure. The biobank will be established in close cooperation with the BBMRI-AT and will heavily benefit from their expertise and the developed management, storage, and QC systems. Within the European EIRENE consortium, it is intended to cooperate closely with the partners in the Czech Republic (RECETOX, Masaryk University). Thus, maximum coherence in sampling, storage and data management will be assured and allow for first-of-its-kind prospective and longitudinal studies. The information on human exposure obtained from specific biological samples will be complemented with environmental samples, which include air, drinking water, environmental contaminants in food, and population-wide data obtained from wastewater-based epidemiology. This research discipline involves the collection of wastewater samples at the influent of a wastewater treatment plant and their analysis for substances related to aspects of public health.

These areas may be expanded upon the needs of the involved research institutions and other stakeholders during the later phases of the RI.

CONSORTIUM MEMBERS

Prof. Dr. Benedikt Warth, University of Vienna (national coordinator)

Benedikt Warth is a professor at the University of Vienna, where he founded the „Global Exposomics and Biomonitoring Working Group“ in 2017. Before returning to Austria, he was an Erwin-Schrödinger fellow at The Scripps Research Institute in San Diego, California, where he

developed and applied novel metabolomics technology to research questions in the field of cancer research and systems toxicology. His research focus is in the area of omics-scale exposure assessment and analytical food chemistry to better understand the in vivo and in vitro effects of environmental and food contaminants.

Prof. Dr. Gunda Koellensperger, University of Vienna

Gunda Koellensperger is an analytical chemist focusing on method development in mass spectrometry. Her expertise covers elemental/metal trace analysis, metabolomics and lipidomics and her research focuses on the development of quantification strategies and new streamlined high throughput workflows enabling both absolute quantification, i.e. targeted -omics as well as non-targeted -omics. More recently she got involved in single cell analysis by elemental imaging.

Dr. Maria Uhl, Environmental Agency Austria

Maria Uhl is a toxicologist with 20+ years of experience in human and environmental monitoring and risk assessment. She is the coordinator of the Austrian HBM Platform and is leading the PARC activities in Austria. Maria Uhl was a Chemical Group Lead of perfluoroalkylated substances (PFAS) within HBM4EU and a member of the PFAS working group at ECHA.

Prof. Dr. Eva Schernhammer, Medical University of Vienna

Eva Schernhammer is a professor of Epidemiology at the Medical University of Vienna and head of the Department of Epidemiology. Besides, she holds an Adjunct Professorship of Medicine (Harvard Medical School) and Epidemiology (Harvard School of Public Health). Her major scientific contributions have highlighted the effects of light at night on cancer risk through the melatonin pathway. This work has led to the establishment of a new classification of shift work as a probable human carcinogen by WHO in 2007.

Dr. Lukas Wisgrill, Medical University of Vienna

Lukas Wisgrill is a resident at the Division of Neonatology and the Pediatric Intensive Care and Neuropediatrics Unit. His current research interests include the neonatal exposome and microbiome and the influence on inflammation and development of extreme premature infants. Further research includes the ontogeny of the neonatal immune system as well as the trained immunity during the transitional phase from the fetal to the postnatal immune system. Currently, he uses system biology approaches to decipher the role of host-microbiome interactions and is establishing a biobank with specimens from premature infants.

Prof. Dr. Claudia Gundacker, Medical University of Vienna

Claudia Gundacker is a biologist and associate professor at the Institute of Medical Genetics, Medical University of Vienna. She is interested in medical ecology and environmental health. After five human biomonitoring studies in which perinatal exposure to environmental pollutants was

investigated, the focus is now on metabolism and transport of metals (mercury, iron, lead, cadmium) and perfluoroalkyl substances (PFAS) in the human placenta. In the search for proteins involved in placental kinetics, she combines human biomonitoring (HBM) and genetics with basic research on placental (patho)physiology.

Prof. Dr. Herbert Oberacher, Medical University of Innsbruck

Herbert Oberacher is an analytical chemist and associate professor at the Institute of Legal Medicine of MUI. Furthermore, he is the scientific head of MUI's Core Facility Metabolomics. His research focuses on the development of advanced techniques for the analysis of small molecules dedicated to applications in forensic, biological, pharmaceutical, and environmental research. Oberacher has 15+ years expertise in the development and application of tandem mass spectral libraries. Pioneering contributions paved the way for tandem mass spectral databases to become generally accepted identification tools. He has published tandem mass spectral libraries together with corporate partners (Wiley, Lipomed).

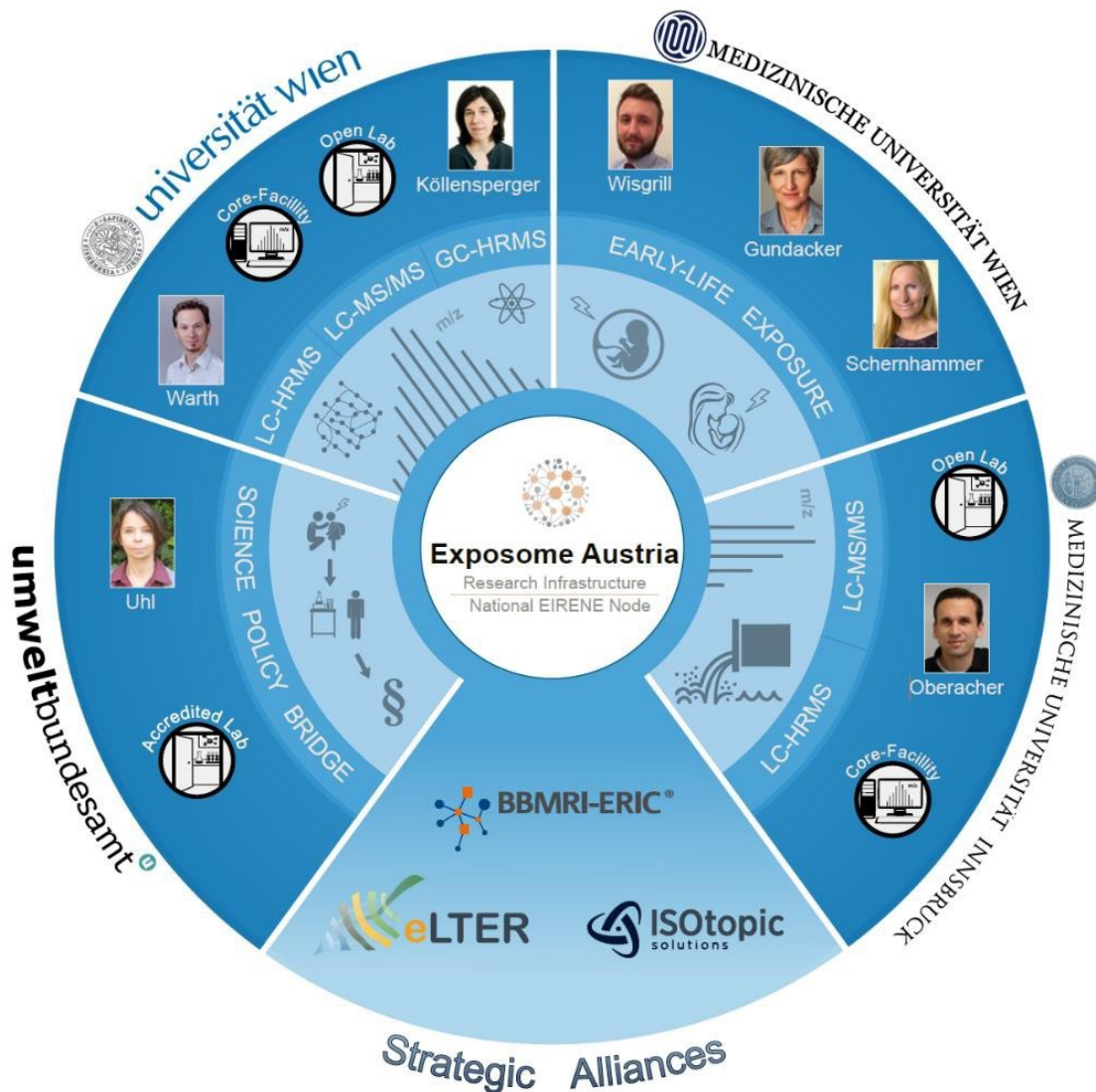


Figure 1 Consortium members of the Austrian National Node Exposome Austria

SERVICES AND FACILITIES

Details about the services will be part of the services and HR inventory survey that will soon be distributed (WP2 and WP6).

POLITICAL AND FINANCIAL SUPPORT

National roadmap status

In August 2020, the **Austrian Federal Ministry of Education, Science, and Research (BMBWF)** confirmed its political support of Austria for the EIRENE research infrastructure project proposal, declaring that Exposome Austria (EIRENE-AT) was currently in the process of implementation. In addition, the ministry announced an official commitment of Austria to support the EIRENE RI during the preparatory and – depending on the outcome – implementation phase. Besides the responsible ministry, the **Federal Ministry of Climate Action and Environment (BMK)** also confirmed its support of the Austrian national EIRENE component.

The fact that the key research focus (environmental exposure assessment) of EA is fully aligned not only with EIRENE at the pan-European level but also with the innovation strategy of the Austrian government (FTI-Strategie 2030), significantly enhances the relevance of such a dedicated infrastructure. Many of the goals defined in the national EA infrastructure document broadly overlap with, or are directly linked to, various national or global initiatives (FTI-Strategy 2030, United Nations Sustainable Development Goals, European Green Deal).

Political support

Since EIRENE RI was listed in the 2021 Roadmap Update of the European Strategy Forum on Research Infrastructure, EA has been receiving political support from two government bodies – the Austrian Federal Ministry of Education, Science, and Research (BMBWF), and the Federal Ministry of Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK). Both ministries support the development of the Austrian National Node financially (more details below and in Section 6).

How the National Node is financed

EA is financed at the institutional, national, and European levels and its funding originates from three main channels:

1. **Internal funding** from the involved institutions: UNIVIE: Mass spectrometer (2022) for organic toxicant analysis (Warth lab) and two postdoc researchers for preparatory phase (2022-2026) as in-kind contributions.

2. **External funding** from European and national programs:

EU: Preparative project (HORIZON-INFRA-2021-DEV-02-01, 2022-2025, only administrative & organizational preparation) and EIRENE PPP (36 months)

National: Ministry of Science (BMBWF) – DigiOmics4Austria (36 months), Ministry of Environment (BMK) – Exposome Austria Preparatory and Industrial Module (72 months)

3. **User fees** received for LC-MS analyses, offers to external projects (ERC, FWF starting/RG grants); in the operational phase of EIRENE, it is expected to widely expand this channel by providing 'Open Access' to users from academia and (to a limited extent) industry.

STAKEHOLDERS

Internal (industry, ministry/department responsible for RIs in your country)

- Consortium members of the Austrian National Node and their teams (see section 1)
- The respective bodies (deanery, rectorate, financial and research departments) from their contributing institutions (UNIVIE, MUW, MUI, EEA)
- EIRENE PPP Management Board
- European EIRENE-PPP Consortium

External

- Austrian Federal Ministry of Education, Science, and Research (BMBWF)
- Austrian Federal Ministry of Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK)
- Austrian federal/state agencies (e.g. AGES)
- Research: private and public research institutions ((e.g. MUG, TU Vienna, MUL, Karl-Landsteiner Private University, a few of FH's)
- Industry: chemical and pharmaceutical companies (e.g. Sciex, Thermo Scientific, Biocrates)
- External Consultation Board: Exosome Austria established a **Scientific & Strategic Advisory Board** in May 2022 that meets annually and oversees the national RIs development and activities. It involves global research, industry, and opinion leaders who support EIRENE and particularly the Austrian National Node. Apart from the annual board meetings, all members agreed on being consulted on an 'as needed basis', especially in the framework of strategic long-term decisions, global harmonization efforts, and political/stakeholder engagement.



Heather Eliassen



Thomas Jakl

Federal Ministry
Republic of Austria
Climate Action, Environment,
Energy, Mobility,
Innovation and Technology



Oliver Mayer

Federal Ministry
Republic of Austria
Education, Science
and Research



Caroline Johnson



Jana Klanova



Gary Miller



Kurt Zatloukal



Yuxia Cui



Figure 2: Members of the Scientific & Strategic Advisory Board, external consultation body to Exposome Austria.



BELGIUM

RESEARCH FOCUS

EIRENE-Flanders will strengthen the Flemish exposome research capacity and integrate it in EIRENE-RI. Its research infrastructure intends to capture the dynamics and multitude of human exposures, lifestyle and biological responses, and relate it to disease incidence and progression, leading to actionable feedback for preventive measures. EIRENE-Flanders will address both stressor and disease-oriented research.

National Node Contact Point

- Jan Theunis
- Jan.theunis@vito.be

Key areas. The complexity of the exposome requires an infrastructure that can:

- efficiently recruit volunteers and collect samples and primary data at large scale;
- efficiently analyse human samples for multiple exposure and effect markers;
- efficiently share, integrate, and analyse individual-level high-dimensional data from multiple complementary sources.

In this first phase towards a comprehensive and internationally integrated Flemish exposome research infrastructure EIRENE-Flanders will invest in:

(i) Large scale recruitment and sampling consisting of (a) a **human sentinel platform** based on the existing occupational health examination system, allowing recruitment among 160,000 individuals; and (b) an operational **micro-sampling** system based on innovative sampling and HTP analytical technologies.

(ii) Primary personal data collection consisting of (a) an **online harmonized questionnaire platform**, giving access to a catalog of questionnaires to collect data on personal characteristics, health status, food, lifestyle, or socio-economic parameters, and **(b) Personal wearable sensors** used to collect physiological and health parameters, and **Apps** for food and exercise logging to collect longitudinal lifestyle data.

(iii) High-throughput analysis of biomarkers of exposure and effect through a) coupling of HTP sampling with LC-MS/MS analysis and proteomics; b) **automation** of workflows of sample handling and analysis; c) development and validation of **LC-MS/MS platforms** for the quantitative measurements of innovative biomarkers of exposure (chemicals and their metabolites, mycotoxins) and of biomarkers of effect (endogenous metabolites and proteins) in biological matrices; and d) development of



an **auto-purification LC-MS system** for purification of new biomarkers for which reference standards are not commercially available.

(iv) **Flemish Exposome Data Hub** offering **integrated data storage, sharing and analysis capacity** consisting of a Data Integration and a Data Analysis Hub. The hub will allow (1) efficient integration of data from questionnaires, personal sensors, and lab analyses collected in longitudinal cohorts, (2) enrich Flemish exposome data with related data from geospatial databases, and (3) efficiently analyze the integrated datasets. The Data Integration Hub will comply with the General Data Protection Regulation (GDPR) rules for personal data.

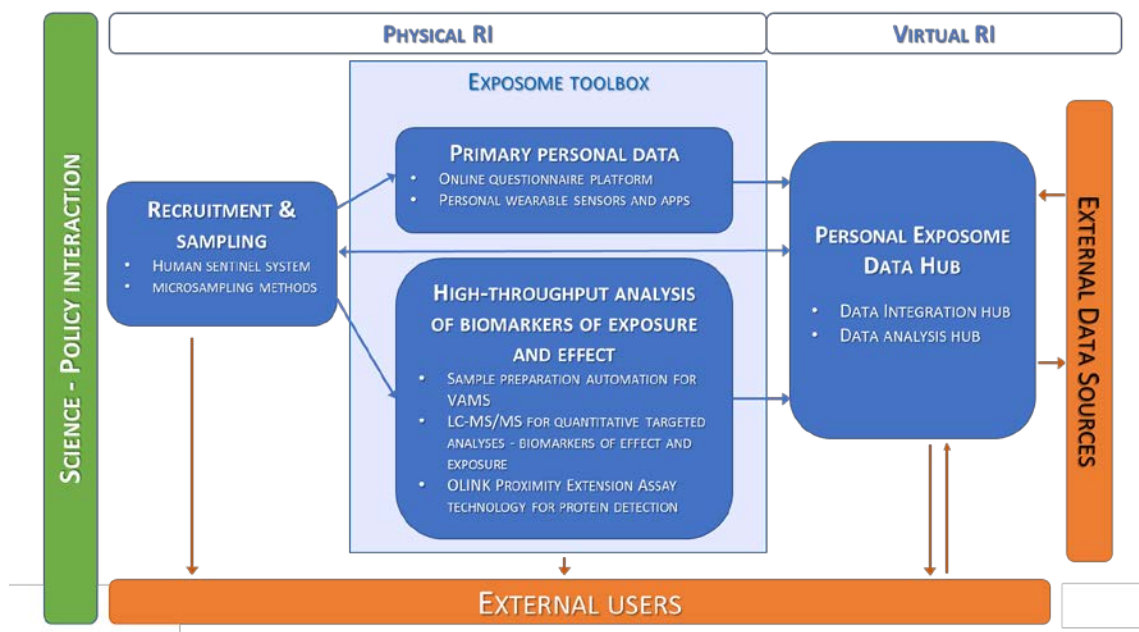


Figure 1: Schematic overview of the EIRENE Flanders platforms: recruitment and sampling, exposome toolbox, data hub

CONSORTIUM MEMBERS

VITO



Jan Theunis

Project Manager Environment and Health within the VITO-Health Unit of the Flemish Institute of Technological Research (VITO, Belgium).

Jan Theunis has worked on several projects related to air quality, including policy studies, management of research and policy studies, and development of spatiotemporal exposure models for air pollution. Since 2015, he has been working

on projects related to early detection and prevention of chronic diseases, including environmental aspects. He has also worked on projects involving data collection with wearables, telemonitoring, exercise, and microvascular health in COPD patients, and retinal hyperspectral imaging for early detection of Alzheimer's disease.

Jan Theunis has rich experience in data science techniques such as machine learning, time series analyses, predictive modeling, and data-driven applications. He is currently (co)leading the FAIR data work package and is a member of the Data Management team of HBM4EU, in which VITO leads the Data Management and Analysis work package.

GENT UNIVERSITY



Prof. Dr. Sarah De Saeger

Full professor at Ghent University, Faculty of Pharmaceutical Sciences, Department of Bioanalysis, Centre of Excellence in Mycotoxicology and Public Health (CEMPH) Prof. S. De Saeger is head of the Centre of Excellence in Mycotoxicology and Public Health (CEMPH) at Ghent University. She is a renowned expert in the field of mycotoxin research and fungal metabolomics with a large network of national and international collaborators. CEMPH focuses on the following research lines: mycotoxins and human health, mycotoxin analytical methods, mycotoxin occurrence, metabolomics and exposomics. Prof. S. De Saeger has an excellent and proven track record in scientific leadership of (international) research projects, infrastructure, consortia and platforms. She is coordinator of the Association Research Platform 'MYCOTOXINS and TOXIGENIC MOULDS' (www.mytox.be) and the International Thematic Network MYTOX-SOUTH (www.mytoxsouth.org).



Prof. Dr. Apr. Christophe STOVE

Associate Professor (100%) at the Laboratory of Toxicology – Department of Bioanalysis - Faculty of Pharmaceutical Sciences - Ghent University.

Prof. Stove has many ongoing (inter)national collaborations and, as a member of the UGhent MSSmall Consortium (focusing on mass spectrometric analysis of small molecules), he is highly acquainted with the use of shared research infrastructure. Within the Laboratory of Toxicology, which he is heading, quite some high-end analytical equipment (4 LC-MS/MS systems, a high-resolution mass spectrometry system and several gas chromatography systems) is present, requiring dedicated managing and maintenance plans. On a global scale, the Lab is at the forefront when it relates to microsampling. This is evident from collaborations or preferred partnerships with almost all key companies that play a role in this field (e.g. CAMAG, Gerstel, Büchi, Neoteryx, Capitainer, Trajan), the leading role of the Lab in the set-up of an International Guideline on how to conduct dried blood microsampling studies, and the leading role of the Lab to develop technologies that allow to tackle issues associated with microsampling (e.g.

patent on dried blood microsampling, EP3359950A1 (EU) and US10222324 (US) ([hyperlink](#)), commercialized by CAMAG ([hyperlink](#)). Since 2017, over 100 publications were realized, many with collaborators from all over the globe (e.g. Australia, Singapore, Russia, the US, the UK and many labs in Europe), with C. Stove being the lead author on most of these.

KU LEUVEN

KU LEUVEN



Prof. Dr. Lode Godderis

Professor at Center for Environment and Health of KU Leuven

Prof. Lode Godderis is occupational health physician and full professor at the Centre for Environment and Health of the University of Leuven. He investigates the impact of work on health in workers by unraveling the underlying epigenetic mechanism and the reverse, how health can affect work (dis)ability. Prof. Godderis also is the current chair of Modernet, an international network for development of techniques for discovering trends in work-related diseases and tracing new and emerging risks. He is also management committee member of EU COST action Omega-Net. Prof. Godderis is also CEO of IDEWE, the biggest External Service for Prevention and Protection at Work in Belgium.

The Environment and Health Unit is part of KU Leuven Department of Public Health and Primary Care, a multidisciplinary department with a focus on community health, best practice and health policy. The research group under supervision of Prof. dr. Lode Godderis concentrates on studying genetic and epigenetic alterations in cells of humans induced by environmental exposure.

UNIVERSITY OF ANTWERPEN



Prof. Adrian Covaci

Full Professor (ZAP-BOF) at the Toxicological Centre, Department of Pharmaceutical Sciences; Faculty of Pharmaceutical, Biomedical and Veterinary, University of Antwerp.

Professor Adrian Covaci is a full professor at the University of Antwerp. He is a member of the Department of Pharmaceutical Sciences and has been associated with the university for several years. His research interests include analytical toxicology, forensic toxicology, and environmental toxicology. He has been a part of the Toxicological Center for over 20 years and has contributed significantly to the field of toxicology analytical method development and validation; human metabolism of new chemicals using in vitro hepatic models and advanced mass spectrometric techniques; elucidation of human exposure pathways and risk assessment for

contaminants of emerging concern; metabolomics for in vitro and in vivo systems using high-resolution mass spectrometry.

ANTWERP UNIVERSITY HOSPITAL



Prof. Dr. Philippe Jorens

Chairman of the department of critical medicine of the Antwerp University Hospital (UZA). Full Professor in critical care medicine and clinical pharmacology/toxicology at the University of Antwerp (UA).

Prof. Jorens' research interests include:

1) Underlying physiopathology and inflammatory reaction in acute organ failure, i.e., the lung and the central nervous system, by combining studies in vitro using advanced cell culture models and in vivo validated animal models and human models, thereby looking at immunology, pharmacology, and pharmacokinetics in sepsis, acute lung injury and neurological emergencies.

2) Exploring the acute and chronic toxicology of chemicals and their detection in several matrices.

Through the clinical departments, Prof. Jorens has access to a large number of phenotypically well-characterized patients (healthy volunteers, critically ill patients, and patients with defined disorders (obesity, dementia, asthma, and COPD .)

The research group of Prof. Jorens has experience in conducting investigator-initiated trials in patients, especially on the value of biomarkers (5-8 new trials successfully performed and/or initiated yearly in the period 2012-2021) which is a guarantee for successfully obtaining relevant patient data and human samples. Prof. Jorens is the coordinator for several international studies in the European COMBACTE consortium.

DEPARTMENT OF ENVIRONMENT



Karen Van Campenhout

Head of Unit Environment and Health, Departement Omgeving (Environment Department) of the Flemish government

Karen Van Campenhout received a degree in bioengineering from Ghent University, in 1999, and obtained a PhD degree in biological sciences from Antwerp University in 2004, for her work on metal toxicity in freshwater fish. Since 2007 she is heading the Environment and Health unit, within the Environment Department of the Flemish government. Karen's work focusses on closing the gap between science and policy when dealing with health and environment policies. Concretely, she is the coordinator of the Flemish phased plan for policy translation of the human biomonitoring results of the Flemish environment and health surveys. Karen is also actively involved in projects on a European level such as HERA, HBM4EU (as a vice-chair of the governing

board and national hub contact point Belgium) and the future Partnership for the Assessment of Risk from Chemicals.

SERVICES AND FACILITIES

Details about the services will be given in the 'the services and HR inventory surveys' that will soon be distributed within EIRENE PPP (WP2 and WP6, respectively).

POLITICAL & FINANCIAL SUPPORT

Following an application made by a consortium of VITO, the University of Leuven, the University of Antwerp, the University of Ghent, and The Environment Department of the Flemish Government, a positive decision was taken by Flanders to participate in EIRENE-RI.

EIRENE-Flanders has garnered steadfast political support from the Flemish Government since the inclusion of EIRENE RI into the 2021 ESFRI Roadmap. The financial framework for sustaining the National Node involves a combination of internal funding, Flemish government support, and European Union (EU) funding. Internally, partners contribute to personnel costs and new infrastructure equipment expenses. Notably, the EIRENE-Flanders consortium successfully secured 4-year funding of 2.85 million Euros through the IRI FWO (The Research Foundation - Flanders) call in 2022. This funding is primarily allocated towards infrastructure development and personnel costs aimed at establishing operational procedures for the equipment. Additionally, EU funding from EIRENE PPP has been utilized by VITO as co-funding for EIRENE-Flanders, constituting 10% of the financial support. Looking ahead, user fees are envisioned as a sustainable financing mechanism. These fees encompass a fee-for-use model, wherein users pay for training, consumables, and other operational aspects when operating the equipment themselves. Alternatively, the fee-for-service model involves users paying the full cost when the equipment is operated by a partner of EIRENE-Flanders.

Internal Stakeholders

- Consortium members of the EIRENE-Flanders Node and their teams (see section 1)
- The respective bodies (deanery, rectorate, financial and research departments) from their contributing institutions (VITO, KU Leuven UAntwerp, UGhent)
- Environment Department of Flemish Government
- VITO Presence on the management Board of EIRENE-PPP
- VITO as a partner in EIRENE-PPP

External Stakeholders

- The Research Foundation – Flanders (FWO)
- The Belgian Federal Public Service (FPS) Health, Food Chain Safety
- Other research institutes in Belgium (VIB, UHasselt, Sciensano, University of Liege, Environmental Health Unit of ISSEP - Institut Scientifique de Service Public in Wallonia)
- Industry: chemical, life sciences, pharmaceutical



CZECH REPUBLIC

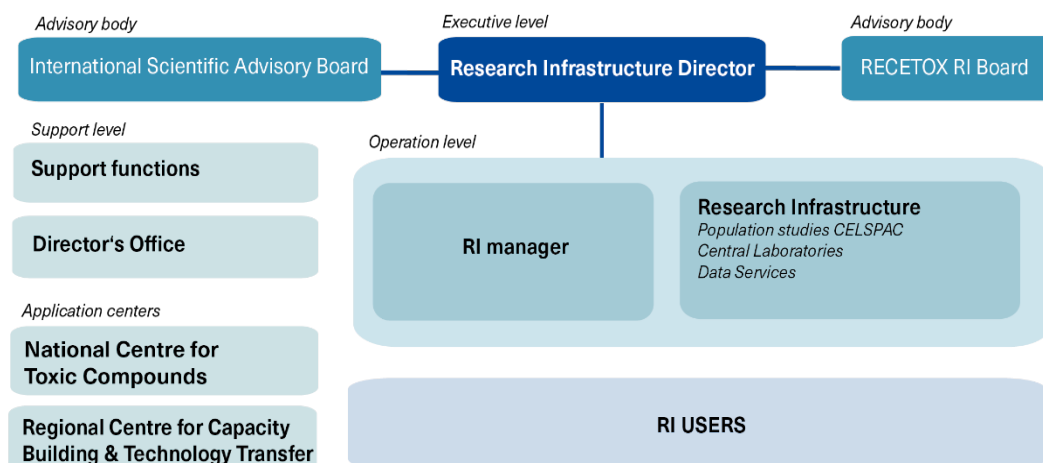
INTRODUCTION

The EIRENE-CZ National Node is comprised of the single-sited RECETOX Research Infrastructure (RECETOX-RI). It is located on the Masaryk University campus in Brno, Czech Republic. This university facility, the largest university construction project in Central Europe, was opened in 2010. RECETOX-RI provides both physical and virtual access to its services which consist

National Node Contact Point

- [Jana Klanova](#)
- Jana.klanova@recetox.muni.cz

of three core facilities – RECETOX Central Laboratories, CELSPAC Population Studies, and the Data Services. The RECETOX Centre occupies 70 laboratories on premises built in 2010-2012 with the support of the European Structural and Investment Fund (ESIF) funding for regional centers of applied research (CETOCOEN project of OP RDI). RECETOX-RI uses about 50 percent of this area; the rest belongs to the Center's research programs. In 2020, RECETOX-RI experimental capacities were enhanced with the completion of the construction of the biobanking facility with advanced technologies and associated sample handling and characterization laboratories. Additional capacities for RI development were acquired in 2021 when MU purchased the next-door INBIT building from the South Moravian Authority. With support from the Horizon 2020 Teaming project complementary funding, this building is being re-constructed for high throughput metabolomic and metagenomic facilities.



RESEARCH FOCUS

RECETOX-RI supports interdisciplinary research in the cross-cutting area of environment & health. The scientific and technology development strategy is driven by existing scientific and societal challenges.

RECETOX CENTRAL LABORATORIES

The Central Laboratories consist of the Trace Analytical Laboratory (TAL), Microbiome Analytical Laboratories (MAL), and Biomarker Analytical Laboratories (BAL).

TRACE ANALYTICAL LABORATORY (TAL)

TAL provides advanced analytical services to RECETOX-RI research teams, as well as to external clients. The staff utilizes state-of-the-art equipment and techniques for sampling, extraction, fractionation, purification, and analysis of samples, applying established analytical methods and working in the QA/QC system. Apart from analyzing “classical” persistent organic pollutants (POPs) such as polychlorinated biphenyls (PCBs), organochlorine pesticides, and polycyclic aromatic hydrocarbons (PAHs), we also analyze polychlorinated dibenzo-p-dioxins, furans, polychlorinated naphthalene and emerging pollutants such as brominated flame-retardants, short- and medium-chain chlorinated paraffins, perfluorinated compounds, polar pesticides and their metabolites, explosives, steroids and natural toxins such as cyanobacterial peptides and alkaloids. Analysis of inorganic compounds includes elemental analysis and determination of heavy metal species.

The laboratories also include Monitoring Networks, and sampling programs of the RECETOX research center focused on long-term monitoring of persistent organic pollutants (POPs) in various components of the environment.

MICROBIOME ANALYTICAL LABORATORIES (MAL)

The Microbiome Laboratories provides advanced resources and expertise to support the analysis of microbial communities in various biological systems. This facility offers a range of services to researchers, including sample processing, NA extraction, preparation of sequencing library, and other molecular biological analyses (SNPs genotyping, gene expression analysis, ELISA analysis, etc.).

The core facility is staffed by expert molecular geneticists and microbiologists who work with researchers to design experiments that generate high-quality microbiome data. The facility's experts are proficient in a wide range of microbiome analysis techniques, including 16S and ITS rRNA gene sequencing, shotgun metagenomics, and target microbial species or gene analysis. The facility also provides support for sample collection and processing, including optimization of sampling protocols and quality control checks. MAL plays a critical role in advancing our understanding of the microbial communities that inhabit various ecosystems, including the human body, animals, models (organoids, biofilms), and environmental samples (soil, water, dust, etc.). By providing expert support and resources, this facility helps researchers analyze microbiome data, identify microbial communities, and understand their roles in various biological systems. Ultimately, this work can lead to insights into the prevention and treatment of various diseases and improvements in environmental management practices.

BIOMARKER ANALYSIS LABORATORY (BAL)

The Biomarker Analytical Laboratories apply mass spectrometry assays for the routine measurement of protein and chemical biomarkers. The lab hosts a chemical bank of authentic standards, mass spectral libraries, and dedicated compound databases.

CELSPAC POPULATION STUDIES

The core facility realizes the CELSPAC epidemiological studies, such as the European Longitudinal Study of Pregnancy And Childhood (ELSPAC) and The Next Generation (TNG), manages large-scale epidemiological studies and uses the existing and newly built biobanking capacity of the center.

The facility consists of the following organizational units:

- Studies management and communication
- Studies design and data management
- Recruitment and Examination
- Biobank and CELSPAC laboratories

CELSPAC is the youngest member of the Research Infrastructure with roots in the European Long-term Study of Pregnancy and Childhood (ELSPAC). The data collected in the Czech Republic and Slovakia as part of the ELSPAC study have contributed significantly to the body of knowledge and understanding of the determinants of human health in the last 25 years. ELSPAC was launched by the WHO in the early 1990s in several European countries and coordinated by Bristol University, UK (ALSPAC: Children of the 90s and CoCo90s study).

The extensive epidemiological database created in ELSPAC made it possible to create the CELSPAC platform, which continues to expand data collection, as well as establish new long-term studies, such as The Next Generation (TNG), and other follow-up studies, building large databases in Central Europe and supporting pan-European research. The follow-up studies have also created new protocols to reflect the Exposome concept.

Close cooperation with the ALSPAC studies and the University College London (UCL) research team implementing the Health, Alcohol and Psychosocial factors In Eastern Europe (HAPIEE) study aim to achieve transgenerational and international uniformity and comparability among individual cohort studies.

The population studies core facility is supported by a new biobanking facility. The biobank was built in cooperation with the Czech national node of BBMRI-ERIC to ensure future compatibility.

DATA SERVICES

The Data Services facility consists of five units. The Information Systems and CERIT SC groups create the system, environment, and support for the operation of the RECETOX research infrastructure and the center's research groups and ensure comprehensive management of research data and their interoperability. At the same time, they also provide access to databases and information systems, such as GENASIS, which enables joint analysis and visualization of environmental contamination data from different providers. The other three parts of the infrastructure, on the other hand, provide users with specific services and biostatistic and bioinformatics analyzes of data from existing databases, but also from new experiments or users' own data, either separately or in connection with other services or research activities.

CONSORTIUM MEMBERS

The EIRENE-CZ National Node is comprised of the single-sited RECETOX Research Infrastructure (RECETOX-RI) located on the Masaryk University campus in Brno, Czech Republic.

RECETOX, MASARYK UNIVERSITY

MUNI | RECETOX



Prof. RNDr. Jana Klánová, Ph.D.

Jana Klánová is a professor of environmental chemistry and the director of RECETOX. She has vast research experience in the field of environmental and health impacts of toxic substances on external and internal environments, products, and food. Using chemical, biological, and mathematical approaches and new technologies, she combines data from long-term environmental monitoring and human biomonitoring programs with the results of laboratory experiments and mathematical models.

In the past decade, she has led numerous European Structural Fund (including OP RDI CETOCOEN and OP RDI CETOCOEN PLUS) projects, as well as European framework program projects totaling almost two billion crowns. She currently coordinates the CETOCOEN Excellence project, which aims to build a European Center of Excellence for Environmental and Health Research and is funded by Horizon 2020.



RNDr. Petra Příbylová, Ph.D.

Petra Příbylová is a leader of Central Laboratories at RECETOX RI and head of Trace Analytical Laboratories (TAL) at RECETOX centre, at Masaryk University since 2012. In 2014, TAL passed through an accreditation process (ČSN EN ISO/IEC 17025:2005) under her supervision. She has expert knowledge of analysis organic compounds in environmental and biotic matrices. Petra Příbylová received her Ph.D. degree from Masaryk University in 2005. During her study and following years worked mainly on new analytical methods development in RECETOX laboratories, in the Technical University of Munich and the University of Bordeaux.

Her responsibility is mainly to lead the analytical labs at RECETOX centre, to organize workflow of sample analysis, standard operation procedures update, method development etc. She is responsible to extend the scope of accreditation by new methods. She is a contact person for authorities, industry, partners, and customers who request analytical support, sampling, and samples analysis.



Mgr. Lenka Andrýsková, Ph.D.

Dr. Andrýsková has been working at RECETOX since 2012 and currently heads the Population Studies unit. She attained a bachelor's and Master's in Mathematics and Biology at Masaryk University's Faculty of Science and a PhD at Mendel University. Her main role involves organizing and managing the epidemiological studies conducted at RECETOX. Under her supervision, the long-term ELSPAC study was digitized in cooperation with the university's Institute of Biostatistics and Analysis, and the ELSPAC database was created.

She is the contact person for parties interested in the two-decade-long epidemiological study data, population studies applicants, and applicants interested in obtaining data and samples of biological material from the population studies. She also chairs Masaryk University's ELSPAC Ethics Committee and is a member of the Brno City Health Board.

As head of the Population Studies Research Infrastructure, Dr. Andrýsková is involved in the follow-up CELSPAC studies: The Next Generation and Young Adults. She and her team support scientists with preparing and implementing short-term research studies, especially studies assessing environmental impacts on human health and development. This support may include guidance in developing protocols and standard operating procedures, as well as providing a legislative framework for epidemiological studies, laboratory, and biobanking capacities.



Elliott James Price, PhD

Elliott Price is a postdoc within the Human Exposome research group of Prof. Jana Klánová. Elliott and his team focus on the development of high-resolution mass spectrometry methods to profile environmental chemicals and metabolites in human biospecimens. The application of these methods is hoped to provide a more in-depth characterization of chemical exposure and associated biological responses. The greater characterization is vital to further understanding the influence of environmental chemicals on health and phenotype.

Elliott gained his PhD and undertook postdoctoral research in the Fraser Lab at Royal Holloway University of London, where he focussed on metabolic profiling of the tropical tuber crop, yam (*Dioscorea* spp.). He then joined MUNI in 2019 as a postdoctoral researcher at the Faculty of Sports Studies & RECETOX.



Mgr. Richard Hůlek

Richard Hůlek is head of the Data Services Core Facility. His expertise in IT is wide - from requirements analysis to user interface design; from complex information systems architecture to data visualization. His equivalent position in the private sector, is solutions architect. During project implementation, Richard provides a communication bridge between the contracting team and the team of specialists who carry out the implementation itself, guaranteeing the successful integration of technological processes.

His main task, together with a team of software engineers and specialists, is to provide services for the development, customization and integration of information and database systems to key research projects.

SERVICES & FACILITIES

The Trace Analytical Laboratories are equipped with top-of-the-line instruments for high-resolution gas and liquid chromatography and high-resolution mass spectrometry (HRGC-HRMS, Orbitrap Fusion LC-MS, Orbitrap Exactive GC-MS, GC and LC-QTOF, LC-QTRAP, GC and LC-QQQ, GC and LC-ICP MS) and proven expertise in target analysis of legacy and emerging environmental contaminants (toxic metals and their species, polychlorinated dioxins and furans, polycyclic aromatic hydrocarbons, PCBs, brominated and organophosphate flame-retardants, perfluorinated surfactants, chlorinated paraffins, plasticizers such as phthalates or bisphenols and their replacements, pesticides, musks, pharmaceuticals and personal hygiene products, food additives and sweeteners, steroids, natural toxins including mycotoxins, cyanobacterial peptides and alkaloids, and their metabolites) as well as suspect and non-target (full-scan) screening applications that are currently being developed. The accredited laboratories also offer a range of accredited sampling instrumentation and expertise for an assessment of the distribution and behavior of chemical compounds in the environment and long-term regulatory monitoring (active and passive ambient air and water samplers, automatic optical dust analyzers, cascade impactors or personal air samplers).

Newly developed experimental capacities for analysis of metabolome, proteome, microbiome, and epigenome offer ultra-high-performance LC-MS for analysis of biologically active substances in biological matrices (stool, blood, urine, amniotic fluid, dried blood spot), analysis of small molecules involved in metabolism, fatty and amino acids as well as quantitative assessment of inflammatory proteins or adaptive immune effectors. 16S rRNA metagenomic sequencing libraries can be prepared in the microbiome laboratories also offering DNA isolation, amplicon preparation and sequencing (Illumina MiSeq system), real time PCR and capillary electrophoresis. Metafer5 scanning and imaging platform with SlideFeeder x80 is available for determination of DNA modification and damage (DNA breaks, chromosomal aberrations, sister chromatid exchange) and genetic implication (DNA methylation), sensitivity of studied material to DNA damage (DNA repair capability) can be assessed in human, animal, and in vitro tissue systems. Toxicological laboratories offer a battery of ecotoxicological tests for aquatic and soil environments (*D. rerio*, *X.laevis*, *D.magna*, *Ch.riparius*, *C.elegans*, *E.fetida*, *F.candida*, *E.crypticus*, algae, cyanobacteria, bacteria) and in vitro testing (molecular and 3R/3D toxicology including stem cells, endocrine disruptive potencies, genotoxicity), high-content toxicological screening, advanced reporter gene assays, as well as equipment for sample processing, imaging, microplate analysis, molecular biology and biochemistry.

Technologies for development of new diagnostic tools include nanosecond laser flash spectroscopy system (170 ps Nd-YAG laser), pump-and-probe spectroscopy system (150 fs Ti:sapphire laser), fast transient kinetic measurements, UV/VIS/NIR absorption spectroscopy, spectrofluorometers, and optical benches for steady-state irradiation experiments, as well as unique expertise in designing, synthesis and testing of new signaling molecules and molecular

carriers. Protein engineering technologies include advanced compact ion chromatography, CD spectropolarimeter, colony picking robot, disintegrator, fermenter, differential scanning calorimeter, isothermal titration calorimeter, rapid quench flow, stopped-flow, microfluidizer, or microplate readers, but especially a unique combination of the innovative experimental approaches (microfluidic chips) and bioinformatic tools based on artificial intelligence.

PHYSICAL AND REMOTE ACCESS TO LABORATORY CAPACITIES

Complex studies on environmental and human exposure, including indoor and occupational exposures (design and implementation of the field studies including long-term monitoring networks, accredited sampling services, accredited laboratory analysis, environmental and human health risk assessment, data interpretation, and modeling)

- Innovative testing technologies (development of passive samplers, personal samplers, etc.)
- Multi-residual target analysis of a wide spectrum of anthropogenic and natural toxins (see above) in various environmental and biological matrices,
- Novel suspect and non-target (full scan) screening of environmental and human samples
- Targeted metabolomics and proteomics on human samples
- Metagenomics - human microbiome, the microbiome in the indoor environment, role in the development of diseases, bacterial resistance, design, and implementation of studies including bioinformatic pipelines for data processing, metagenomic sequencing libraries
- Assessment of DNA modification and damage, genetic implication, and sensitivity to DNA damage in human, animal, and in vitro tissue systems,
- Toxicological and ecotoxicological testing using a battery of experimental models, development of adverse outcome pathway models,
- Assessment of the potential to affect the activity of hormonal receptors in several in vitro cell models,
- Cultivation of cell cultures, including advanced 3D cultivation and real-time cell analysis (non-invasive detection of cell viability and growth),
- Immunochemical detection of biomarkers (ELISA, Western blot), detection of gene expression using quantitative RT PCR, study of gap junctional intercellular communication,
- Physiologically based pharmacokinetic modeling for assessment of the distribution of target chemicals in the human body and linking external and internal exposure
- Design of biosensors for detection of environmental pollutants, determination of the structures, thermodynamic parameters, and stabilities of proteins, production of natural and engineered biocatalysts, protein purification, analysis of enzymatic activities and substrate specificity profiles
- Design, synthesis, and characterization of new photoactivatable compounds and supramolecular assemblies for biology and medicine.

VIRTUAL ACCESS SERVICES

- Design, implementation, and long-term support of longitudinal and cross-sectional (bio)monitoring and population studies
- On-demand development of data repositories, interdisciplinary multilevel database systems, and web portals optimized for multiuser groups

- Development of environmental models, assessment systems, and tools supporting decision-making in ecological risk assessment, including data management and visualization tools using GIS
- Analyses of causality, spatial patterns, and temporal dynamics in environmental data,
- Development of national inventories and implementation plans for the international conventions, preparation of related national and regional reports, effectiveness evaluation of the conventions, including capacity building and training in these areas
- Export, analysis, and/or interpretation of raw or aggregated exposure data available in the in-house environmental data warehouses
- Export, analysis, and/or interpretation of pseudonymized and/or aggregated population data (including socioeconomic, demographic, or lifestyle data)
- Processing, characterization, and storage of biological material from population and clinical studies according to validated SOPs
- Providing aliquots of available samples for specific (exposure and effect) studies
- Linking exposure and effect (mechanistic toxicology, AOPs), risk assessment and modeling
- Integrative data analysis and interpretation, advanced biostatistics, and bioinformatics.

TRAINING, CAPACITY BUILDING, AND TECHNOLOGY TRANSFER SERVICES

- Science-to-policy interface (National Centre for toxic compounds, Regional Centre for Capacity Building and Technology Transfer),
- Capacity building workshops for scientists, regulatory sector, policymakers and relevant stakeholders,
- Innovation platform for the commercial sector,
- International summer schools,
- Student research projects at all levels, events for schools and gifted students,
- Individual consultations and training events in all research areas above
- Science popularisation and public events.

POLITICAL & FINANCIAL SUPPORT

RECETOX RI has been on the Roadmap of Large Research Infrastructures of the Czech Republic in the Environmental Sciences field since 2010. The Roadmap, which was first prepared in 2010, is updated every several years by the Czech Ministry of Education, Youth, and Sports (MEYS). MEYS is the public authority in charge of the policy-making and public funding of large research infrastructures (LRIs). It is also the public funding provider for LRIs using both the state budget and the EU Cohesion Policy Funds, thereby financing the operations and investments of LRI projects. MEYS is also mandated to develop and implement international cooperation in R&I, including membership of the Czech Republic in international R&I organizations and ERIC consortia.

RECETOX-RI completed its last evaluation for the 2023 Roadmap update in 2021 with the highest possible score in an International peer-review assessment of Czech LRIs. The assessment also included a proposal for funding for the next financial period (2023-2029). Securing financial resources for future development of RECETOX-RI at a similar level until 2029 is an important step towards the long-term sustainability of RECETOX-RI.

Special attention deserves the H2020 Widening Triplet: CETOCOEN Excellence Teaming Phase II project develops long-term strategic partnerships with UCL London, ETH Zurich, and BBMRI-ERIC to enhance the research capacities and the international competitiveness of the RECETOX Centre.

This project is especially relevant for the strategic development of RECETOX-RI as it is one of the key areas of change of the project and a target of major investments. The complementary R-EXPOSOME ERA Chair project introduces a new international team led by recognized scientists to develop expertise in epidemiology. Finally, the URBAN_X TWINNING project (completed in 2023) is another project developing expertise in the assessment of urban exposures, this time in collaboration with the European leaders of this field, ISGlobal in Barcelona, Utrecht University, and UCL in London. It will further strengthened the international teams and harmonized existing Czech cohorts.

STAKEHOLDERS

Internal Stakeholders

- RECETOX staff
- Management Board of EIRENE
- Masaryk University

External Stakeholders

- Czech public authorities (e.g., Ministry of Environment, Ministry of Education Youth and Sports)
- Other ESFRI Research Infrastructures, in particular BBMRI-ERIC, ACTRIS-ERIC, and ELIXIR.
- European project partners (e.g., in PARC, IHEN, SPHERA)
- Industrial partners, such as Thermo Fischer in Brno
- Local and regional authorities (e.g., Brno city, South-Moravian Region)
- European agencies (e.g., DG-RTD, DG ENV, EFSA, ECHA, JRC)





FINLAND

INTRODUCTION

A formal national node has yet to be established in Finland, but there is close collaboration nationally in the field of environmental exposure assessment between the Finnish Institute for Health and Welfare (THL), the Finnish Institute of Occupational Health (FIOH), and the Finnish Food Authority.

National Node Contact Point

- [Hanna Tolonen](#)
- Hanna.tolonen@thl.fi

Due to financial constraints, each organization has a limited capacity to commit to Research Infrastructures (RIs), and there is a likelihood of further reduction in funding in the coming years. This anticipated financial challenge poses difficulties in taking on new commitments. Consequently, there is consideration for the possibility of proceeding without establishing a new National Node for EIRENE. Instead, exploring integration with an existing Research Infrastructure focused on Population-Based Surveys is being contemplated. This alternative not only addresses financial constraints but also offers the advantage of minimizing administrative burdens associated with the establishment of a new Node.

CONSORTIUM MEMBERS

FINNISH INSTITUTE OF HEALTH & WELFARE (THL)



THL has laboratory analysis servicesⁱ. The Laboratory of Chemical Risks offer analytical services for persistent organic pollutants POPs: dioxins, PCBs, PFASs etc) and other environmental pollutants including chemicals from consumer products (parabens, bisphenols). The analytical services are primarily available for collaborative research projects and, depending on the analysis, also for external clients. Analytical services for single samples are agreed on a case by case basis. The methods are suitable for human samples such as serum, breast milk and urine, and for environmental samples, food, consumer products, water, and feed.



The methods are specifically tailored for situations where standardized methods are not available or suitable. The methods can be accommodated to the needs of research partners, and thus the standard sets of compounds are flexible. If needed, new methods for toxic environmental pollutants can be developed.

The analytical instrumentation include, for example: Gas chromatographs with a triple quadrupole mass spectrometer (GC-MS/MS), high-performance liquid chromatographs coupled to a triple quadrupole mass spectrometer (LC-MS/MS), and various

extraction

systems.

In order to achieve the highest possible accuracy in quantification, isotopically labeled standards are used when available, and the laboratory regularly participates in interlaboratory comparison studies.

The Ministry of Agriculture and Forestry has designated the laboratory as the Finnish National Reference Laboratory for halogenated persistent compounds in food (23/2006) and feed (86/2008). The laboratory is in accordance with the requirements of Regulation 882/2004.

Most of the methods are accredited by the Finnish national accreditation body FINAS (SFS-EN ISO/IEC 17025:2005, laboratory T077) and the same level of quality control is applied to other analyses as well.

A large collection of population cohorts (cross-sectional with register follow-up) from most of which there is also stored biological samples is available. More information is available onlineⁱⁱ.

FINNISH INSTITUTE OF OCCUPATIONAL HEALTH (FIOH)



FIOH has laboratory analysis and testing and assessment of risk and safety at work environmentsⁱⁱⁱ.

The Finnish Institute of Occupational Health presents a comprehensive array of services tailored to address varied analytical requirements. This facilitates a meticulous evaluation of chemical risks at both individual and task-specific levels through **Biomonitoring** analyses. Moreover, FIOH offers the capability to assess sensitization to biological dust by conducting antibody analyses on serum samples. Within the advanced **Indoor Air Laboratory**, stakeholders access a broad spectrum of analyses encompassing mold, dust, volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs), aldehydes, asbestos, and other elements.

FIOH's dedication to safety is evident in the **Emission Testing of Building Materials**, a pivotal aspect of their services providing reliable information on the emissions of various building materials. This service comprises three distinct products tailored for different applications: bulk or total emission testing, Field and Laboratory Emission Cell (FLEC), and surface emission testing using a chamber technique, all maintaining high-quality standards.

With a commitment to ensuring occupational health, FIOH's **Analyses of Asbestos and Other Harmful Substances** offer a variety of services for identifying such substances in building materials, air, and surface swab samples. Their expertise extends to the examination of asbestos in rock material samples. The analysis portfolio covers a broad spectrum, including asbestos, PAHs, PCB, lead, heavy metals, mineral oil, and quartz.

It is noteworthy that FIOH's laboratory methods maintain accreditation from the Finnish national accreditation body FINAS, underscoring their dedication to delivering services of the utmost quality and reliability. The laboratory methods are accredited by the Finnish national accreditation body FINAS.

The Finnish Food Authority has laboratory services and reference laboratories^{iv}. The Finnish Food Authority's laboratories conduct essential laboratory diagnostics for animal and plant diseases, as well as analyses of food, feed, fertilizers, and plants. These laboratories provide expert services in these domains. The laboratory methods adhere to accreditation standards set by the Finnish national accreditation body FINAS.

POLITICAL & FINANCIAL SUPPORT

Finland has a national roadmap for research infrastructures^v, which is periodically updated, with the latest roadmap covering the years 2021-2024. In the current roadmap, there is no specific research infrastructure (RI) designated for activities similar to EIRENE. THL and FIOH are part of the Finnish Research Infrastructure for Population-Based Surveys (FIRI-PBS)^{vi}, which aligns closely with EIRENE activities. Currently, FIRI-PBS is in its preparatory phase, and applications for the next updating round are likely to open in 2024. While being on the national RI roadmap enhances visibility and recognition, it does not guarantee funding. Some Academy of Finland funding is earmarked for RIs on the roadmap, but obtaining it is competitive.

If EIRENE evolves into an ERIC, EIRENE Finland's participation requires approval from relevant Ministries and, ultimately, from Parliament due to the formal and complex nature of ERIC as a legal entity. The current status and inclination for participation in new ERICs are uncertain. If Finland joins the EIRENE ERIC, funding for membership fees would be secured through the Academy of Finland.

No formal political or financial support is currently provided to the National Node.

STAKEHOLDERS

Environmental exposure assessment is of interest for the Ministry of Social Affairs and Health as well as for the Ministry of Economic Affairs and Employment and Ministry of Agriculture and Forestry. On local level (e.g. cities and Centres for Economic Development, Transport and the Environment) also conduct environmental and health risk assessments concerning activities in their area.

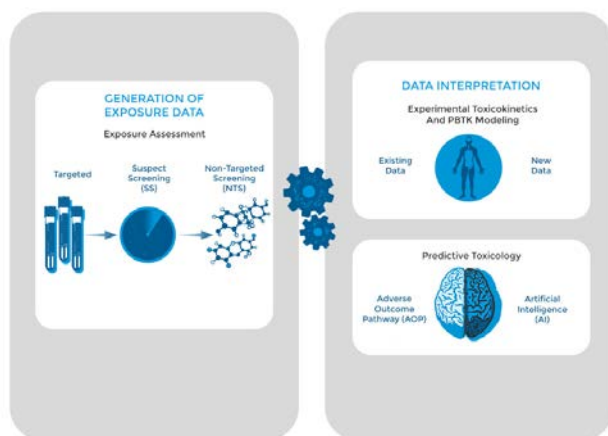
INTRODUCTION

France Exposome is a national research infrastructure coordinated jointly by *Institut national de la santé et de la recherche médicale* (INSERM) and the *École nationale vétérinaire, agroalimentaire et de l'alimentation*, Nantes-Atlantique (ONIRIS). The EHESP School of Public Health, the *Institut national de recherche pour l'agriculture, l'alimentation et l'environnement* (INRAE), the *Institut national de l'environnement industriel et des risques* (INERIS) and Université de Paris Cité are partners of the infrastructure and participate in the governance of France Exposome.

National Node Contact Point

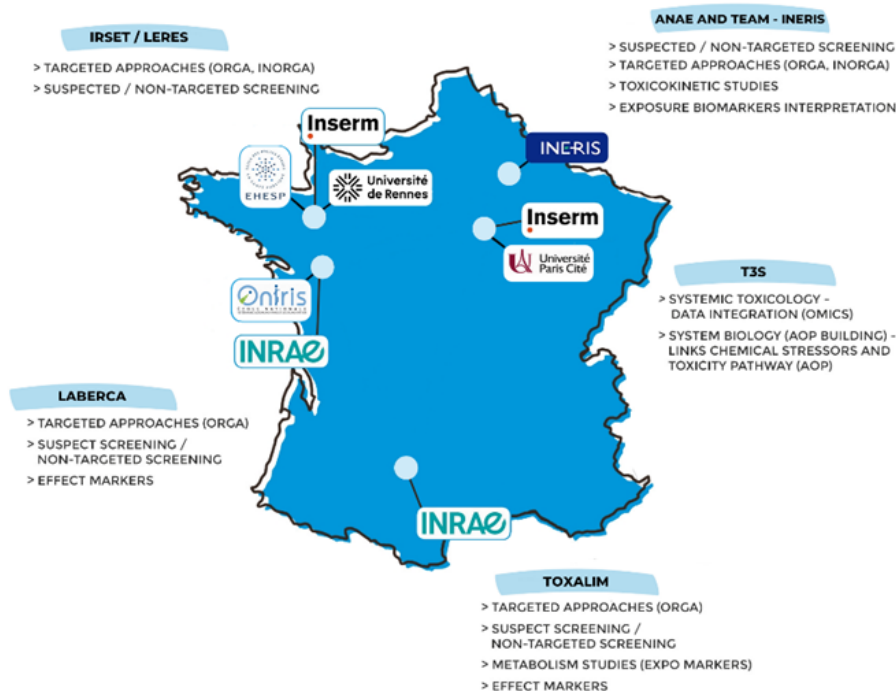
- Vincent Bessonneau
- vincent.bessonneau@ehesp.fr
- +33 (0)2 99 02 29 20

RESEARCH FOCUS



France Exposome aims to structure and gather scientists working on the human chemical exposome, in the environmental health field, via targeted and non-targeted characterization (mainly involving mass spectrometry) of exposure biomarkers, toxicokinetic modelling and predictive toxicology. France Exposome offers innovative methods and tools to support research aiming to better understand the links between exposure to chemicals and adverse health outcomes.

CONSORTIUM MEMBERS



INSTITUTE	PI	EXPERTISE AND SERVICES
LERES-IRSET (INSERM, EHESP)	Michel Samson	Targeted quantitative analysis of organic chemicals (IC-MS/MS, GC-MS/MS and LC-MS/MS) and metals (ICP-MS/MS)
	Vincent Bessonneau	
	Arthur David	Suspect screening and non-targeted analysis (LC-HRMS)
	Sarah Lennon	
	Fabien Mercier	Analysis and interpretation of HRMS data
LABERCA (ONIRIS, INRAE)	Bruno Le Bizec	Targeted quantitative analysis of organic chemicals (GC-MS/MS, GC-HRMS and LC-MS/MS)
	Jean-Philippe Antignac	Suspect screening and non-targeted analysis (LC-HRMS, GC-HRMS and GCxGC-HRMS)
	Philippe Marchand	
	Alicia Grivaud	Analysis and interpretation of HRMS data
	Ronan Pommereuil	
INERIS	Céline Boudet	Targeted quantitative analysis of organic chemicals (GC-MS/MS and LC-MS/MS) and metals (ICP-MS/MS)
	Céline Brochot	
	Florence Zeman	Suspect screening and non-targeted analysis (LC-HRMS)
	Hughes Biaudet	PBPK (facility for <i>in vitro</i> and <i>in vivo</i> experiments)
T3S (UNIVERSITÉ DE PARIS CITÉ)	Robert Barouki	System biology and artificial Intelligence (AOP)
	Xavier Coumoul	Combination of multiomics dataset (transcriptomics and metabolomics) to exposure data
	Karine Audouze	
	Etienne Blanc	

TOXALIM (INRAE)	Laurent Debrauwer	Suspect screening and non-targeted analysis (LC-HRMS)
	Emilien Jamin	Analysis and interpretation of HRMS data

POLITICAL AND FINANCIAL SUPPORT

France Exposome is a research infrastructure (RI) in the field of environmental health, part of the 2021 national RI roadmap of the French Ministry of Higher Education and Research. Initially focused on human internal chemical exposure, France Exposome will progressively work to link the internal and external exposure data to include all environmental actors (e.g. including diet) with a view to identify the determinants of exposure. The general aim of France Exposome is to allow our country to reach a conceptual, technological and scientific turning point for the provision of services offer to characterize the human chemical exposome.

Over the last few years, several institutes from France Exposome have received significant investment (over 7 M€) at the regional, national and European level to improve facilities and add new equipment. In addition, as part of the France Exposome consortium agreement, each partner institution will provide, every year, funding for operation (7k€/institution).

STAKEHOLDERS

France Exposome positions itself as a complementary and relevant RI in the existing landscape of French RIs, notably France Cohorts (health cohorts RI), France Génomique (genomics RI), ProFI (proteomics RI), and MetaboHUB (metabolomics RI). France Exposome will interact with all these RIs to address human exposure to chemical contaminants and adverse health outcomes, linking exposure and effects biomarkers.

In addition, the governance of France Exposome has been designed to maintain tight relationships with internal stakeholders (representatives of each institution) as well as key external stakeholders, including national agencies for the environment and health (i.e., ANSES and Santé Publique France) to ensure France Exposome is aligned with the needs of the scientific community and public authorities in charge of risk assessment and management.



GERMANY

INTRODUCTION

LIFE Child is continuing its collaboration with UFZ in the field of mobile sensors. In 2023, more than 500 children were equipped with mobile sensors for air quality for a week. This year a project was established with the Federal Institute for Risk Assessment (Bundesinstitut für Risikobewertung) to assess PFAS in a large collection of blood samples.

National Node Contact Point

- [Christof Meigen](#)
- christof.meigen@medizin.uni-leipzig.de



Bundesinstitut für Risikobewertung



INTRODUCTION

EIRENE_EL constitutes a nationwide network of research infrastructures that facilitates interdisciplinary research on the human exposome, operating at the intersection of environmental and health sciences. The RI brings together expertise in chemical analyses of environmental and biological samples, biological science and engineering, toxicology, environmental and human exposure and risk assessment, molecular epidemiology, biostatistics, bioinformatics, biokinetics, systems biology, big data analytics, artificial intelligence, and spatial modeling. EIRENE_EL is designed to provide education, training, capacity building, and translation of scientific advancements into market innovation and policy, promoting precision prevention and exposome-informed public health protection.

National Node Contact Point

- Denis Sarigiannis
- sarigiannis@auth.gr

CONSORTIUM MEMBERS

- Aristotle University of Thessaloniki (AUTH), Thessaloniki
- National Hellenic Research Foundation (NHRF), Athens
- National and Kapodistrian University of Athens (NKUA) – Department of Medicine, Athens
- National Center for Scientific Research Demokritos (NCSR-D), Athens
- University of Western Athens (UNIWA) – Department of Food Science and Technology, Piraeus
- University of Thessaly (UTH) – Departments of Biochemistry and Veterinary Medicine, Larisa
- Athena Research Center (ATHENA), Athens
- University of Aegean – School of Environment, Lesvos
- University of Crete (UoC) – Department of Medicine, Iraklion
- Foundation for Research and Technology Hellas/Institute of Chemical Engineering Sciences (FORTH/ICE-HT), Patra
- Hellenic Center for Marine Research (HCMR) – ELKETHE, Athens
- Democritus University of Thrace (DUTH) - Komotini





ICELAND

INTRODUCTION

The Node is built on a previous cooperation for Food and Health data named FutureFood (Framtíðarfæða). This Node includes the University of Iceland, the Agricultural University, the University of Reykjavik and MATIS. The Node itself is currently not on the Icelandic Research Infrastructure Roadmap, but it has successfully participated in two larger project that are i.e., the Icelandic Research e-Infrastructure Project (IReIP) and Chemical analysis – from elements to biomolecules (EFNGREIN). Calls for the next Icelandic roadmap for research infrastructure from the Icelandic Research Council will be advertised in the near future. The Node will then partake. Currently there is no financial support from the ministry or industry, but the Node has political support from the Ministry of Health and is seeking additional support.

National Node Contact Point

- [Torhallur Halldorsson](#)
- tih@hi.is



Miguel Morinatti; AP News

INTRODUCTION

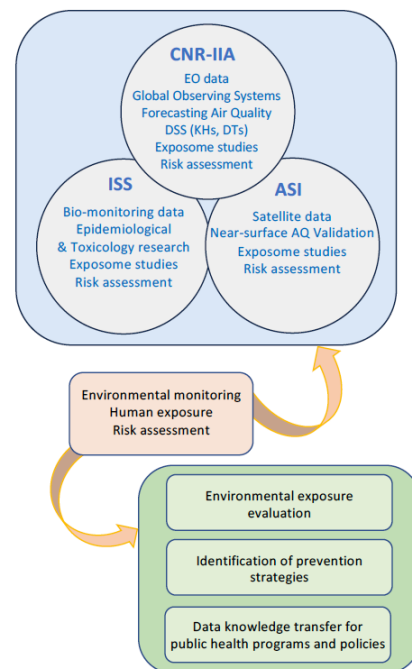
The Italian National Node of EIRENE, EIRENE-IT, was officially established in 2024 and involves three partner institutions: The National Research Council of Italy (CNR), having the Institute of Atmospheric Pollution Research of the CNR (CNR-IIA) as the coordinating unit, the Italian Space Agency (ASI), and the Istituto Superiore di Sanità (ISS). All partner institutions have consistent skills with the aims of the European research infrastructure EIRENE RI and have developed, as highlighted in the following sections, relevant research activities in the environment-health sectors of a highly multidisciplinary nature in the context of national and international projects and partnerships.

National Node Contact Point

- Nicola Pirrone
- nicola.pirrone@iia.cnr.it

RESEARCH FOCUS

The Institute of Atmospheric Pollution Research of the CNR (CNR-IIA) acts as coordinator of the Italian node of EIRENE RI. It has consolidated experience in environmental research and in providing technical-scientific support to institutional bodies in the preparation and implementation of environmental legislation relating to air quality (QA), industrial emissions, integrated environmental authorizations, environmental impact assessments (VIA and VAS), and the development of permanent infrastructures (monitoring networks) for the characterization of air and environmental quality at national, regional and global scale. CNR-IIA collaborates with major national (i.e., ISPRA, ENEA, ASI, ISS, universities) private (i.e., ENI, ENEL, A2A), and international bodies (i.e., Max Plank, MIT, Harvard, University of Michigan, CNRS, ESA, CSIC, NOA) as part of research projects, which it often coordinates, aimed at the development of standard methods (UNI, CEN) for the characterization of environmental critical issues [i.e., air quality, industrial emissions, emission abatement systems, biogeochemical cycles of persistent pollutants (i.e., heavy metals, Hg, POPs, PFOS)], and the development of interoperable systems (i.e., Knowledge Hubs, Digital Twins) to support decisions at different spatial scales. At a national level it has supported (and currently supports) the Ministry of the Environment and Energy Safety (MASE) (formerly the Ministry of the Environment, MATTM) in the various phases of preparation and implementation of European directives (i.e., air quality,



REACH), and international treaties (i.e., Agenda 2030 SDG, UNECE/LRTAP, Minamata, Stockholm, Rotterdam, Basel), also carrying out roles as Head of the Italian Delegation in the INC (Intergovernmental Negotiating Committee) and COP (Conference of Parties). At a national level, is very important the coordination by the CNR-IIA of the Special Networks project (2011-2024) financed by MASE and developed in partnership with the ARPE/ISPRA, ISS and ENEA systems, since it allowed the development of a national atmospheric monitoring network to deal with to the infringement procedure of the European Court against Italy (in 2014) on exceeding the limits from 2010 set by the European Directive on air quality (2008/50) in many Italian urban centers. The Special Networks project produced data and standard procedures (SOPs) which laid the foundations for the participation of the CNR in the MAIA program which ASI is developing with NASA JPL (see section below), and that will represent a very important contribution to the Italian national node of EIRENE RI.

CONSORTIUM MEMBERS

NATIONAL RESEARCH COUNCIL OF ITALY | INSTITUTE OF
ATMOSPHERIC POLLUTION RESEARCH (CNR-IIA) | SCENDERE GIÙ IL
LOGO CORRISPONDENTE A IIA



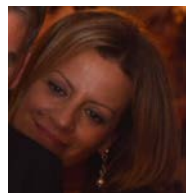
Prof. Nicola Pirrone holds the position of Research Director at the National Research Council (CNR) of Italy and Adjunct Professor at the School of Public Health of the University of Michigan. He was the Director of the Institute of Atmospheric Pollution Research of the CNR (2008-2018) and a Visiting Scholar at the Harvard John A. Paulson School of Engineering and Applied Sciences (SEAS) (2018-2019). He serves as an expert for major international and national public organizations in the field of environmental research and policy development. He is a Representative of the EU Presidency in the ad-hoc group for the Effectiveness Evaluation of the Minamata Convention, an Italian Representative in the Group on Earth Observation (GEO), and a Member of the EU HLWG and Executive Committee of GEO. He has been the vice-head of the Italian delegation at the Conference of Parties (COP1 and COP2) of the Minamata Convention and Head of the Italian Delegation for the UNECE-LRTAP-EMEP Executive Board. He has been the Principal Investigator of several national and international projects and programs (60+) aimed at improving our understanding of the biogeochemical cycle of persistent pollutants and enhancing the use of Earth Observations in various domains of Earth system science and sustainable development. He is the Italian Representative (GEO Principal of Italy), jointly designated by the Italian Ministry of Research and Ministry of Energy and Environment in the Intergovernmental Program on Earth Observations (GEO), co-chair of the Horizon Europe Partnership on “Agriculture of Data” (designated by Italian Ministry of Research and European Commission), and coordinator of the EIRENE Italian Node.



Dr. Francesca Sprovieri is the Research Director and Head of the Rende Division at the CNR-IIA. She has more than 20 years of experience in atmospheric mercury and other hazardous air pollutants studies on regional and global scales, with special emphasis on the Mediterranean and Polar Regions. She has coordinated several research projects and WPs funded by major research institutions in Italy and in the EU as well (EU-DG Res., DG-Env., CNR). She is an expert member of WGs at National and European level (i.e., Italian National Unification Body – UNI; (WG25) EC-DG Environment & European Committee for Standardization (CEN)-TC264 on European standard methods for monitoring air quality; UNECE-LRTAP Convention related to the Task Force on Heavy Metals) as well as WGs related to policy development and environmental evaluations. She is the author/co-author of over 250 publications in peer-reviewed journals, books, chapters, and international reports.



Dr. Sergio Cinnirella is a Senior Researcher at CNR-IIA Division of Rende; he has 33 years of experience in GIS and environmental data management. Dr. Cinnirella has been WP Leader of large-scale EU and national projects (e.g., KNOWSEAS, GMOS, I-GOSP) as well as Pilot leader for E- SHAPE, for which developed interoperable systems as a contribution to the GEO. He has published over 100 research articles in peer-reviewed literature, international proceedings and books and has been part of several WGs in the framework of UNEP and UNECE-LRTAP related to the assessment of pollutants emission to the atmosphere.



Dr. Teresa Sprovieri, Ph.D. in Clinical Neurosciences and Advanced Degree in Clinical Pathology; She is a Research scientist at the Institute of Atmospheric Pollution Research, National Research Council of Italy (CNR-IIA), Division of Rende, and lecturer at the University of Calabria, with more than 20 years of experience in Clinical Neurosciences and in the fields of molecular genetics, genomics and environmental biomonitoring. She has expertise in the development and validation of analytical methods for metals in the environment and humans. She is the author/co-author of over 150 publications in peer-reviewed journals, books, chapters, and international reports.



Dr. Carmine Ungaro, Ph.D. in Clinical Neurosciences and Advanced Degree in Clinical Pathology, is a Research Scientist at the National Research Council - Institute of Atmospheric Pollution Research (CNR-IIA), Division of Rende, and lecturer at the University “Magna Graecia” of Catanzaro, with experience in the fields of molecular biology, metabolomics, and environmental biomonitoring. Expertise in development and validation of analytical methods for metals in the environment and humans. He has published more than 40 peer-review papers.



Dr. Virginia Andreoli, Ph.D., is a clinical pathologist with thirty years of experience in molecular genetics for human diseases, especially neurodegenerative diseases. She works as a research scientist at the Institute of Atmospheric Pollution Research, National Research Council of Italy (CNR-IIA), Division of Rende. Research on human exposure pathways and the evaluation of markers of susceptibility to adverse health outcomes is currently the main area of investigation. Several peer-reviewed journal papers detail research activity.



The Italian Space Agency (ASI) develops, also in collaboration with different agencies from other countries, satellite missions in the field of Earth Observation and promotes the use of the observed data for both scientific and application purposes. Of particular relevance for the purposes of EIRENE are the national PRISMA mission operational since 2019, the MAIA and SBG missions currently under development in collaboration with NASA/JPL, and the IRIDE system under development within the PNRR as well. The MAIA (Multi-Angle Imager for Aerosols) satellite mission is aimed at improving understanding of how different air pollutants impact on human health. In particular, ASI has launched a development program for the improvement of air quality modelling and the development of PM predictive models for the consequent risk assessment of the population.

Dr. Giovanni Rum holds a degree in Mechanical Engineering and spent the majority of his career, from 1981 to June 2006, at the Italian Space Agency (ASI), as Project and Program Manager and Department Head. From 1999 to 2006 he was Deputy Head and Head of the ASI Earth Observation Department and Italian delegate to the ESA Earth Observation Program Board. From June 2006 to December 2016, he served as Senior Programme Officer at the Secretariat of the Group on Earth Observations (GEO). Major duties included the coordination of the GEO Forest Carbon Tracking Initiative and the coordination of the preparations for the GEO Ministerial Summits in Geneva (January 2014) and in Mexico City (November 2015). Since 2018 to date he holds the position of Senior Advisor on Earth Observation matters at the ASI, providing support to IRIDE and MAIA programs, and to the SCO initiative and acting as GEO focal point for ASI.

Dr. Francesco Longo holds the position of Head of the Earth Observation and Operations Division of the Italian Space Agency (ASI), National Delegate to the ESA Earth Observation Program Board (PBEO), and Expert to the EU Copernicus Committee. He gained a university M.Sc. degree in Aerospace Engineering at “Politecnico di Torino”, as well as a M.Sc. degree in Astronautical Engineering and a PhD in Aerospace Engineering at the University of Rome “Sapienza”, completing also a Master in Space Systems Engineering (MSSE) at the Delft University of Technology (NL). He started his professional career at ASI, where since 2015 has been in charge of the Program Office set up for the EO national missions and the SAR COSMO-SkyMed Second Generation constellation (CSG). Between 2013 and 2015, he was the program manager for various EO missions such as the hyperspectral mission PRISMA, the PLATINO missions equipped with mono and bi-static SAR and with multispectral thermal infrared sensors. Previously, between 2006 and 2013, he was in charge of various planetary exploration programs carried out in collaboration with NASA JPL (e.g. Jiram and KaT instruments on the JUNO mission, launched in 2011) and with ESA (e.g. Simbio-sys, ISA and MORE instruments on the BepiColombo Mission to Mercury, launched in 2018).

Dr. Matteo Picchiani



The Istituto Superiore di Sanità (ISS) – The Italian National Institute of Health is the leading technical and scientific public body of the Italian National Health Service. Its activities include research, control, training and consultation in the interest of public health protection. The ISS is involved in collaboration and consultation with other institutions responsible for public health, including the Ministry of Health, the regional health authorities, local health agencies and hospitals. In particular, the Environment and Health Department (DAMSA) of the ISS has the mission to protect the human population through the definition and control of types and sources of chemical and biological risks, especially of environmental origin. It defines guidelines for the implementation of environmental (bio) monitoring programs and proposes preventive measures for risk management and reduction. Research activities include multidisciplinary studies on exposure to chemical, physical and biological agents, and their effects on human health and environment (water, air, soil). Special consideration is given to: persistent toxic pollutants (PTS such as PAHs, dioxins, PCBs, flame retardants); plant protection products and residues; pesticides, metals; powders and fibres; natural toxins; mutagenic and carcinogenic substances. Research on toxicity mechanisms – using advanced techniques, alternative methods, chemo-biokinetic studies and the identification of biomarkers – aims at characterizing health risks in the population, in sensitive groups (e.g. children, pregnant women) and in groups that are particularly susceptible on account of genetic and/or acquired factors. The overall goal of these activities consists in the evaluating the health risk (risk assessment) deriving from environmental exposures, the identification of prevention strategies to avoid and reduce the risk of diseases due to environmental factors, and finally, the transfer of scientific knowledge into public health programs and policies.

Dr. Elena De Felip, Ph.D, is Executive Scientist, Head of the Unit of Toxicological Chemistry at the Environment and Primary Prevention Department and Head of the Unit “Human Exposure to Environmental Pollutants” at the Environment and Health Department. Specific expertise in the assessment of human exposure to environmental pollutants through human biomonitoring. National representative in EC Groups on Human Biomonitoring, and in UNEP and UNEC WGs on human exposure to environmental pollutants. Author of over 70 publications in peer-reviewed journals.

Dr. Annalisa Abballe, Ph.D, is Researcher at Department of Environment and Health, Istituto Superiore di Sanità. She has extensive experience in human biomonitoring studies of Persistent Organic Pollutants (POPs), assessment of human exposure associated with the presence of POPs in the environment, implementation and maintenance of Laboratory Quality Management System (ISO 17025).

Dr. Beatrice Bocca, is Senior Researcher at Department of Environment and Health, Istituto Superiore di Sanità. Extensive expertise in human biomonitoring of environmental contaminants and identification of biomarkers for health prevention and risk assessment, including validation of analytical methods for metals, metal species and metallic nanomaterials.

Dr. Stefano Caimi, is Senior Researcher at Department of Environment and Health, Istituto Superiore di Sanità. Expertise in development and validation of analytical methods for metals, metal species and metallic nanomaterials, implementation and maintenance of Laboratory Quality Management System (ISO 17025). Expertise in the assessment of human exposure to metals through human biomonitoring studies and identification of biomarkers of exposure for health prevention and risk assessment.

Dr. Giovanni Forte, is Senior Researcher at Department of Environment and Health, Istituto Superiore di Sanità. Expertise in development and validation of analytical methods for metals. Expertise in the assessment of human exposure to metals and metal species through human biomonitoring studies and identification of biomarkers of exposure for health prevention and risk assessment.

Dr. Anna Laura Iamiceli, is Senior Researcher at Department of Environment and Health, Istituto Superiore di Sanità. She has extensive experience in environmental monitoring studies investigating the occurrence of POPs in environmental matrices and biomonitoring studies related to human exposure to chemicals.

Dr. Anna Maria Ingelido, Ph.D, is Researcher at Department of Environment and Health, Istituto Superiore di Sanità. She has extensive expertise in human biomonitoring of POPs and assessment of human exposure associated with the presence of POPs in the environment, with particular focus on contaminated sites.

Dr. Flavia Ruggieri, Ph.D, is Researcher at Department of Environment and Health, Istituto Superiore di Sanità. She has expertise in the assessment of human exposure to metals and metal species through human biomonitoring studies and identification of novel biomarkers of exposure for health prevention and risk assessment.

POLITICAL AND FINANCIAL SUPPORT

In April 2020, the Italian Ministry of the Environment and Energy Safety (MASE) (formerly the Ministry of the Environment, MATTM) confirmed its political support of Italy to the EIRENE research infrastructure project proposal declaring that it will be built on existing capacities of the Italian Research Institutions (EIRENE_IT), contributing to improve the understanding of the impact of exposures on human health, linking the research to the evidence-based decision taking and policy making, and by supporting research and innovation. The Italian National Node (EIRENE_IT) is currently in the process of implementation. Besides, the Ministry of University and Research (MUR) also confirmed its support, including EIRENE RI in the IR of High Strategic Priority at the national level (PNIR 2021-2027). The fact that the key research focus (environmental exposure assessment) of EIRENE_IT is fully aligned not only with EIRENE at the pan-European level but also with the innovation strategy of the Italian government (Agenda 2030), significantly enhances the relevance of such a dedicated infrastructure. Many of the goals defined in the national EIRENE_IT

infrastructure document broadly overlap with, or are directly linked to, various national or global initiatives (Agenda 2030, United Nations Sustainable Development Goals, European Green Deal).

Since the EIRENE RI was listed in the 2021 ESFRI Roadmap, EIRENE_IT has been receiving political support from the Italian Ministry of the Environment and Energy Safety (MASE) (formerly the Ministry of the Environment, MATTM) through a supporting letter to EIRENE RI (16/04/2020).

The Ministry of University and Research (MUR) has included EIRENE RI in the IR of High Strategic Priority at the national level (PNIR 2021-2027).

The operational costs of EIRENE_IT are covered by National, European and International projects and programs (i.e., HORIZON EUROPE, NSF, UNEP-GEF etc.). EIRENE_IT funding is derived from three primary sources. Firstly, internal funding is secured from the participating institutions, allocating resources such as two postdoctoral researchers for the preparatory phase (2023-2025) as an in-kind contribution. Additionally, external funding is obtained through European projects, including EIRENE PPP (GA-101079789; €140k, 2022-2025) and EUROGEOSec (GA-101134335; €234k, 2023-2025). Furthermore, national funding is received from the APEMAIA project funded by ASI (€300k) and the Reti Speciali project under the Ministry of Environment (MASE) for the National Network (€220k, 24 months). Lastly, the initiative aims to generate revenue through user fees for EC/OC and ICP-MS-MS analyses, extending services to external programs, networks, and projects. In the operational phase, there is a strategic plan to significantly expand this funding channel by offering 'Open Access' to users from academia and, to a limited extent, industry.

STAKEHOLDERS

Internal Stakeholders

- Consortium members of the Italian National Node and their teams
- Bodies (financial and research departments) from respective contributing institutions
- Management Board of EIRENE PPP
- European EIRENE-PPP Consortium

External Stakeholders

- The Italian Ministry of the Environment and Energy Safety (MASE) (formerly the Ministry of the Environment, MATTM)
- Italian Ministry of Agricultural, Food and Forestry Policies (MASAF)
- Italian State Agencies
- Private and public Research Institutions
- Industry

INTRODUCTION

[EIRENE-NL](#) (formerly known as NIFER) is part of the Dutch Research Council (NWO) roadmap of LRIs in the Life Sciences & Health sector. More specifically, EIRENE is part of the domain Life and Medical Sciences, group Health Sciences, HEALTH-Research Infrastructure (Health-RI) (see annex 2, page 48). EIRENE-NL is coordinated by Prof. R. Vermeulen, Utrecht University. EIRENE has the project status in the ESFRI roadmap.

National Node Contact Point

- [Roel Vermeulen](#)
- r.c.h.vermeulen@uu.nl

CONSORTIUM MEMBERS

The Dutch National Node of EIRENE has four initiating members (Utrecht University, University Medical Center Utrecht, Amsterdam University Medical Centers and Leiden University) and is a spin-off of the Gravitation program Exposome-NL. The aim is to have an inclusive infrastructure facilitating groundbreaking research. Identification of additional services that could be offered through EIRENE-NL is ongoing. The following Dutch universities and institutes are currently considering offering services through EIRENE-NL: Wageningen University & Research (WUR), Rijks Universiteit Groningen (RUG), University Medical Center Groningen, TNO (Netherlands Organisation for Applied Scientific Research), Radboud Nijmegen, Erasmus Medical Center, RIVM (National Institute for Public health and the Environment), TU Delft, Sanquin, KWR Water.



UTRECHT UNIVERSITY AND UNIVERSITY MEDICAL CENTER UTRECHT



Roel Vermeulen (National coordinator) PhD is Professor of Environmental Epidemiology and Exposome Science at Utrecht University and University Medical Center Utrecht. He focuses on environmental risk factors for non-communicable diseases, merging epidemiology, exposure assessment, and molecular biology to unveil new risks. He leads international projects, such as EXPANSE, and AURORA and national projects Exposome-NL, to drive exposome research, emphasizing high-resolution exposure monitoring and 'omics signatures for environmental health and precision medicine progress. He has established open research infrastructures (Exposome-Scan, Exposome-Maps) and established networks for

exposome research (i.e. IHEN). His expertise bridges epidemiology, exposure assessment, and molecular biology in transformative exposome technologies.



Jelle Vlaanderen, PhD is Associate Professor in Exposome Science. He conducts his research within fields of interest 'air pollution', 'occupational risk factors', and 'cancer'. He is one of the partners in HBM4EU. He is a member of the Dutch Expert Committee on the Classification of Carcinogenic Substances of the Dutch Health council. He is the coordinator of the yearly 'molecular epidemiology of chronic disease and the exposome' course and is active in teaching in both BSc and MSc biomedical curricula in Utrecht.



Jeroen Lakerveld, PhD is epidemiologist and public health researcher focusing on the social and built environmental determinants of lifestyle behaviours and chronic disease outcomes. He is the PI of the Geoscience and health cohort consortium (GECCO), which provides access to exposure data to researchers and to 23+ Dutch cohorts affiliated to GECCO. The GECCO infrastructure is embedded in Exposome-NL and EIRENE-NL.

Expertise Utrecht University and University Medical Center Utrecht:

Exposure science, geo-spatial modelling, epidemiology, health research and (bio)-informatics and (bio)-statistics.

LEIDEN UNIVERSITY



Thomas Hankemeier, PhD is Professor in the Analytical Biosciences and Metabolomics Group at the Leiden Academic Centre for Drug Research. He leads one of the worldwide esteemed groups in developing and applying metabolomics and exposomics technologies. He has developed innovative technologies for enriching small molecules, and to applying these to large-scale studies and small samples such as organ-on-chip samples down to single cells. His research aims at innovative analytical tools for metabolomics and exposomics-driven systems biology in personalized health strategies.

Expertise Leiden University:

Analytical chemistry, biomedical applications, electrophoresis-mass spectrometry, high resolution mass spectrometry, metabolomics, pathway analysis.



Amsterdam University Medical Centers (Amsterdam UMC) is represented by **Dr. Jeroen Lakerveld** and by **Prof. Dr. Ir. Joline Beulens** from the group on 'Lifestyle and Chronic Disease Epidemiology' at the Department of Epidemiology & Data Science. Beulens is Professor of Lifestyle and Cardiometabolic Disease Epidemiology and the main focus of her research is on aetiology and prevention of cardiometabolic diseases with a specific focus on the role of health behaviours. She uses large observational studies to quantify the association of different risk factors or exposures with the occurrence type 2 diabetes and cardiovascular diseases or to accurately predict those with a high risk of developing those diseases.

Expertise Amsterdam University Medical Centers

Exposome-Cohort analysis, epidemiology, Built-environment, health research and (bio)-statistics.

SERVICES/FACILITIES

The services of EIRENE-NL have not been completely determined as the infrastructure is still in the preparation phase. Examples of potential services and facilities are given below.

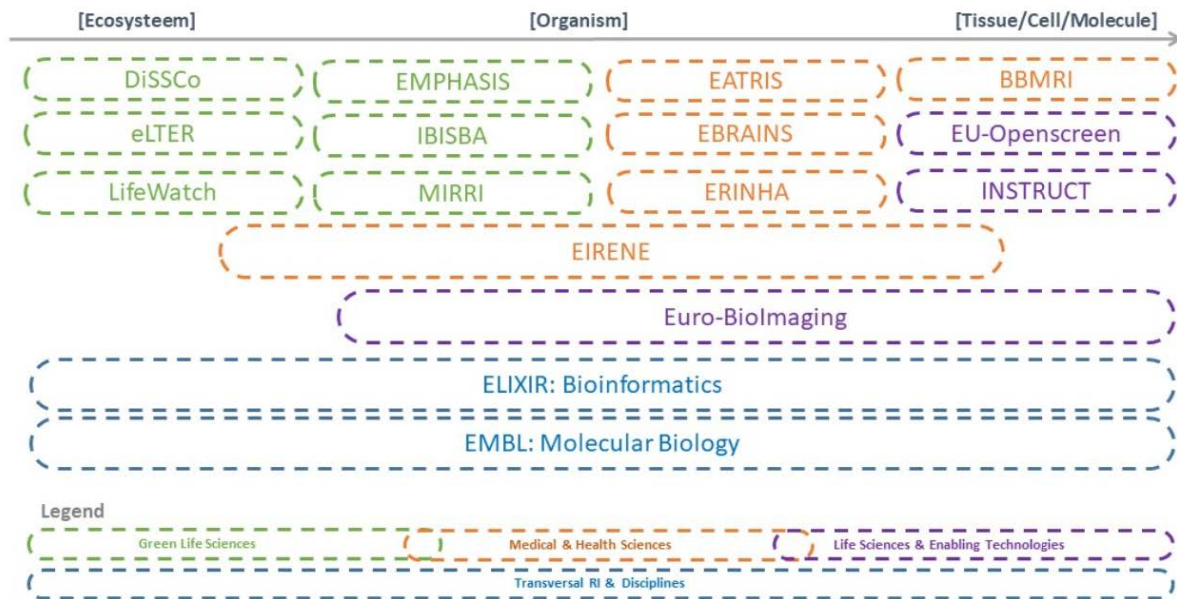
SERVICE	FACILITY / TOOLS
COLLECTING AND PROVIDING SAMPLES (INCLUDING BIO, ENVIRONMENTAL, AND SPECIMEN BANKS) TO DETERMINE EXOGENOUS SUBSTANCES.	<ol style="list-style-type: none"> 1. Access to human biobanks through collaboration with the National Cohort Consortium (NCC), BBMRI, and EATRIS. 2. Access to environmental banks (i.e., sewage samples)
ACCESS TO INDIVIDUAL-LEVEL HUMAN HEALTH AND EXPOSURE DATA THROUGH FEDERATED DATA SOURCES	research initiatives and infrastructures such as NCC, Health-RI, Odissei, Exposome-Maps, etc.
MEASUREMENTS OF EXOGENOUS SUBSTANCES INCLUDING TARGET AND NONTARGETED MEASUREMENTS OF CHEMICAL MIXTURES (OR OTHER POLLUTANTS) AS WELL AS PARENT AND TRANSFORMATION EXPOSURE MARKERS IN HUMANS AND THE ENVIRONMENT.	High-resolution and high-throughput mass spectrometry facilities for exposomics and metabolomics non-targeted measurements.
OMICS-BASED ANALYSIS OF MARKERS OF BIOLOGICAL RESPONSE (SEPARATE: METABOLOMICS, LIPIDOMICS, ADDUCTOMICS, (EPI)GENOMICS, METAGENOMICS/MICROBIOMICS, TRANSCRIPTOMICS, PROTEOMICS, PHENOMICS).	Different OMIC core facilities exist within the Netherlands. Some of these are covered under the X-OMICs initiative.
QUANTIFICATION/DETERMINATION OF TOXICITY (HUMAN- AND ECOLOGICAL), PATHWAYS AND MODES OF ACTION (IN-VIVO, EX-VIVO, IN-VITRO, IN-SILICO)	Different labs and organisations are involved in in-vivo, in-vitro and in-silico assessment of chemical risks. These are covered (in part) under the Virtual Human Project for Chemical Safety. Currently, a toxicological group within ELIXIR is formed.

BIostatistical AND/OR BIOinformatics TOOLS AND PLATFORMS TO INVESTIGATE THE EXPOSOME AND HUMAN HEALTH INTERACTIONS.	High-dimensional and time-varying information on the exposome requires the development of novel biostatistical and bioinformatics tools. Services could be delivered through ELIXIR or EIRENE.
DATABASES AND EXPOSURE MAPS ON ENVIRONMENTAL FACTORS (E.G. POLLUTANTS, TEMPERATURE, NOISE, SOCIO-ECONOMIC, LIFESTYLE)	<ol style="list-style-type: none"> 1. Exposure maps on environmental factors have been collated within the Exposome-Maps FAIR datapoint. This collates information from several sources such as GECCO, Exposome-NL, CBS etc. 2. Information on social environments through Odissei
FAIR CATALOGING OF EXPOSOME DATA (E.G. COHORTS, ALGORITHMS)	Several different resources/infrastructures for FAIR cataloging exists. This consists of DANS, Health-RI, Molgenis
TRAINING	Several institutions offer training on topics relevant to exposome research. Offerings could consist of Summer Schools, microcredits, doctoral programs.
ADDITIONAL SERVICES	

POLITICAL & FINANCIAL SUPPORT

In 2015, the Ministry of Education, Culture and Science (OCW) set up the Permanent Committee for [Large-Scale Research Infrastructure](#) (LRI) to work towards a sustainable ecosystem of LRI in the Netherlands. Starting and maintaining a LRI is essential for the position of Dutch science in Europe and worldwide: it makes a significant contribution to innovation and to solving major social issues relating to the environment, climate, health and civilization. The Dutch Research Council (NWO) is one of the most important science funding bodies in the Netherlands and realizes quality and innovation in science. Each year, NWO invests almost 1 billion euros in curiosity-driven research, research related to societal challenges and research infrastructure.

[EIRENE-NL](#) (formerly known as NIFER) is part of the Dutch Research Council (NWO) roadmap of LRIs within the topsector Life Sciences & Health. More specifically, EIRENE is part of the domain Life and Medical Sciences, group Health Sciences, HEALTH-Research Infrastructure (Health-RI) (see annex 2, page 48). EIRENE has the project status in the ESFRI roadmap. A recent Infrastructure portfolio analysis was executed by NWO which places EIRENE in a dense landscape of large scale RIs in the Life and Medical Sciences Domain. The need for coordination and positioning between RIs in the domain was addressed as important. Therefore, EIRENE-NL involves representatives of other RIs (e.g. BBMRI, ELIXIR, EATRIS) to prevent fragmentation, duplication and redundancy.



EIRENE has full political support as the research infrastructure is placed on the national roadmap of large infrastructures in the Netherlands. Representatives of the government and research councils are actively involved in building the infrastructure through discussions during EIRENE-NL meetings and lobbying for exposome research in the Netherlands.

However, currently, the Dutch node of the EIRENE infrastructure is not financed beyond the PPP. Principal Investigators of Exposome Research groups within EIRENE-NL have in the past participated in roadmap application for funding but were as yet unsuccessful. As EIRENE is a European funded project, the preparation of the European Research Infrastructure on Exposome Research does make important steps. The Dutch node, and in particular the UU as beneficiary and WP2 lead of EIRENE PPP, benefits from this project because it creates momentum to further define the roles and responsibilities of the Dutch partners within the node. It must be realized however, that multiple research groups in the Netherlands do invest time (in kind) to build and shape EIRENE-NL both scientifically as well as structurally without additional funding.

STAKEHOLDERS

Representatives of the Ministry of OCW (Education, Culture and Science), the Dutch research councils and RVO are in close contact with the EIRENE-NL node. Through these stakeholders, EIRENE-NL is informed and advised on ongoing funding processes, the embedding in the national roadmap and the linkage with Horizon Europe. Furthermore, EIRENE-NL informs the stakeholders on the status of the research infrastructure. For names and details, see annex 1.

INTRODUCTION

As of today the National Node of Norway consists of NIPH, with other partners being ready to join after a successful application for funding within the Norwegian research funding schemes for research infrastructures. The Node is led by Department of Food Safety (PI Dorte Herzke replacing Cathrine Thomsen in 2023, and others), but other coworkers from the Division of Climate and Environmental Health are also involved, representing the Department of Chemical Toxicology and Department of Air Quality and Noise.

National Node Contact Point

- [Dorte Herzke](#)
- Dorte.Herzke@fhi.no

RESEARCH FOCUS

The services that NIPH and the other national node members offer EIRENE cover a state-of-the-art platform for human biomonitoring, access to samples and data from the Norwegian Environmental Biobank and facilities to explore NAMs and NGRAs. **Biomonitoring platform.** We run well-equipped laboratories for chemical analytical research on human exposure to persistent and non-persistent organic pollutants with a focus on biomonitoring of breast milk, blood and urine. State-of-the-art instrumental methods available include GC-MS/MS, APGC-MS/MS, LC-MS/MS systems together with a number of HRMS instrumentations. We are using online extraction and clean-up methods, as well as an LC-QToF that can be used both for targeted and non-targeted analyses. The laboratory has established a detailed Quality Assurance system including analyses of in-house control samples and reference materials, and regular participation in external interlaboratory comparisons. The biomonitoring platform is available for national and international researchers and public bodies and has been involved in numerous research project the last decade. **The Norwegian Environmental Biobank (NEB)** is conducted by the Norwegian Institute of Public Health. The aim of the NEB is to monitor levels of nutrients, environmental contaminants and other undesirable substances in our bodies, and assess how these change over time and affect our health. The NEB is a sub study of the Mother, Father and Child Cohort Study (MoBa), a prospective population based pregnancy cohort study. In NEB we collect samples and questionnaire data from triades of mother, fathers and children. The first sample collection campaign was performed in 2016-17 and has been part of the HBM4EU project while the second campaign is performed in 2024 as part of the general survey in the PARC project.

CONSORTIUM MEMBERS

NIPH is a governmental institution under the Ministry of Health and Care Services. We collaborate closely with other ministries, and the Norwegian Food Safety Authority and the Norwegian

Environment Agency in particular. We also collaborate with a wide range of both national and international universities and research institutes.

Key personnel at NIPH



Dorte Herzke is a senior scientist at the Norwegian Institute of Public Health (NIPH), leading the research activities on POPs and PFAS. She is the PI and contact person for NIPH in EIRENE. She has profound experience in development of analytical methods for determination of persistent organic pollutants (POPs) in biological samples including poly- and perfluoroalkyl substances (PFASs). She has participated in a number of studies on human exposure of environmental contaminants.



Cathrine Thomsen has headed the department of Food Safety for more than ten years and has profound experience in the development of research projects, project management and personnel/administrative management.



Line Småstuen Haug is a senior scientist at the Norwegian Institute of Public Health (NIPH). She is the principal investigator for the Norwegian Environmental Biobank and she is the head of Centre for Sustainable Diets at NIPH. She has profound experience in development of analytical methods for determination of persistent organic pollutants (POPs) in biological samples. She has substantial expertise in biomonitoring and human exposure to environmental contaminants, and in particular poly- and perfluoroalkyl substances (PFASs). She has participated in a number of studies on health effects of environmental contaminants. She also been involved in risk assessments and hazard assessments for PFAS and other POPs, amongst other as member of working groups in EFSA and IARC

The national node presently consists of:

- Norwegian Institute of Public Health (NIPH) (lead)
- University of Oslo, Department of Chemistry (UIO)
- The Norwegian veterinary institute (NVI)
- Research institute for water and the environment (NIVA)
- The climate and environmental research institute (NILU)
- The Cancer Registry of Norway (CRN) (to be included in NIPH in 2024)



UiO : **University of Oslo**



NTNU
Norwegian University of
Science and Technology



Veterinærinstituttet
Norwegian Veterinary Institute



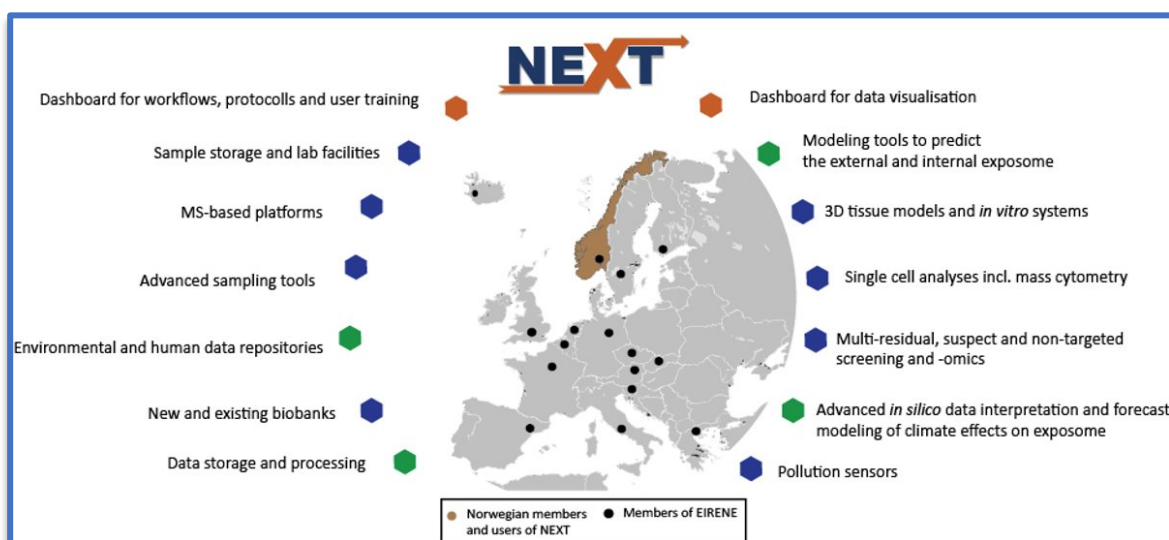
SERVICES & FACILITIES

- Access to harmonized and advanced methodology: Workflows, analytical pipelines and inventory of available infrastructure and methods.
- *Characterization of exposure*: Innovative sampling tools, wearable sensors, dedicated laboratory facilities as clean rooms, tools for chemical analyses (multi-residual, targeted and non-targeted screening, multi-omics, MS imaging).
- Study of mechanisms of action and biological effects: 3D tissue models and other advanced *in vitro* systems (organoids, single cell analysis by genomics, metagenomics, transcriptomics, proteomics, and metabolomics).
- *Contact surface* to existing and new biobanks (Existing Norwegian Environmental specimen bank, the Norwegian environmental biobank (NEB), a novel national faecal biobank including diet and lifestyle data, a biobank with samples from wildlife and farm animals)
- *Data* storage, curation, visualisation, and integration capacities including data handling and quality assurance measures (compliant with FAIR principles and the European Open Science Cloud (EOSC)), ethical guidelines and bioinformatic tools.
- *Databases and in silico models* on exposome, access to data and federated analyses.
- *Dissemination*: Stakeholder workshops, Early career training activities.
- Direct link to the EIRENE RI infrastructure and expert network.

POLITICAL & FINANCIAL SUPPORT

The national road map for infrastructure was launched in June 2023 by the Norwegian Research Council, pointing out the need for greater research efforts in the area of the impact of diffuse emissions of hazardous substances in order to map the origin, spread and isolated and interacting effects of established and new pollutants, aligning well with the overall aims of EIRENE.

The Research Council of Norway launched a call for Research Infrastructure with dead-line November 15th 2023. NIPH applied for funding for the «*Norwegian EXposome plaTform – NEXT - The Norwegian EIRENE*». Thus we have been working on establishing a national node and the proposal in 2023.



STAKEHOLDERS

Stakeholders consist of four target groups – I) the broad exposome research community, II) application-oriented stakeholders (industry, sanitary agencies, policymakers, and international organisations), and III) national authorities, funding bodies, and RCN and ESFRI community, and IV) the general public. Stakeholders are also expected to take part in the further development of the strategy by playing an active role in the Advisory board (e.g., Norwegian Environmental Agency, Universities, and others).



SLOVAKIA

RESEARCH FOCUS

SLOVAK MEDICAL UNIVERSITY (SZU)

Assessment of environmental exposure of population (general population, sensitive subpopulations – children, pregnant women) to chemicals and associated health effects, targeted analyses of organohalogen compounds and metals and metal species in environmental, food, feed and biological samples, including human samples.

National Node Contact Point

- [Lubica Murinova](#)
- lubica.murinova@szu.sk

SLOVAK TECHNICAL UNIVERSITY, FACULTY OF CHEMICAL AND FOOD TECHNOLOGY

Screening analyses incl. non-target screening, identification of unknown organic compounds in the environment, food and human samples

COMENIUS UNIVERSITY, FACULTY OF NATURAL SCIENCES

Analytical method development, targeted analyses of prioritized chemicals (plastification, PAH, PFAS) in human samples

CONSORTIUM MEMBERS

SLOVAK MEDICAL UNIVERSITY (SZU)



Ľubica Murínová, Department of Environmental Medicine, Faculty of Public Health

Kamil Čonka, Department of Toxic organic Pollutants, Faculty of Medicine

Vlasta Mašánová, Department of Metallomics, Faculty of Medicine

SLOVAK TECHNICAL UNIVERSITY, FACULTY OF CHEMICAL AND FOOD TECHNOLOGY



Ivan Špánik, Institute of Analytical Chemistry

Renáta Gorová, Department of Analytical Chemistry, UK Research Park

Helena Jurdáková

SERVICES & FACILITIES

SLOVAK MEDICAL UNIVERSITY (SZU)

Environmental exposure of population, databases of data from epidemiological studies, including cohort studies, biobanked samples, organization / implementation and management of epidemiological studies, accredited analysis of toxic persistent organic pollutants (POPs) and analysis of metals and metal species in environmental, food, feed and biological samples, incl. human samples

Instrumentation: two analytical instruments based on gas chromatography coupled to high-resolution mass spectrometry (GC-HRMS MAT and GC-HRMS DFS) as the most accurate trace analysis methods for POPs (isotope dilution method); equipment for sample preparation (e.g., Dionex ASE300, PowerPrep FMS); inductively coupled plasma mass spectrometer (ICP-MS) equipped with gas and liquid chromatograph (GC/HPLC-ICP-MS), flame and flameless atomic absorption spectrometer (FAAS, GF-AAS).

SLOVAK TECHNICAL UNIVERSITY, FACULTY OF CHEMICAL AND FOOD TECHNOLOGY

chemical analyses including non-target screening.

Instrumentation: Multidimensional separation methods as the most powerful analytical techniques for the screening of unknown compounds; comprehensive gas chromatograph with a high-resolution mass spectrometer (GCxGC-HRTOF-MS) a comprehensive gas chromatograph with a mass spectrometer (GCxGC-TOF-MS) equipped with cryofusion modulators, 3 comprehensive gas chromatographs equipped with a mass spectrometer, a flame-ionization detector and by an electron capture detector (GCxGC-quadrupole-MS, GCxGC-FID and GCxGC-ECD) with a flow modulator, multidimensional gas chromatograph with a heart-cut switching system with a mass detector and a flame-ionization detector (GC-GC-MS(FID)).

COMENIUS UNIVERSITY, FACULTY OF NATURAL SCIENCES

Method developments and chemical analyses of organic compounds in biological and environmental matrices

Instrumentation: liquid chromatograph with a mass spectrometer with a single quadrupole, a liquid chromatograph with a triple quadrupole, a liquid chromatograph with a mass detector with a 3D ion trap and DAD, a gas chromatograph with a triple quadrupole and a gas chromatograph with a high-resolution mass spectrometer (GC-HRTOF-MS).



POLITICAL & FINANCIAL SUPPORT

In Slovakia, the National RI Roadmap was prepared for the years 2020-2030. EIRENE-SK is stated among the RIs which are being prepared.

EIRENE-SK has political support from the Slovak Ministry of Education, Science, Research and Sport (2020). So far, no financial support has been obtained.

STAKEHOLDERS

Ministry of Health of the Slovak Republic, Public Health Authority, The Slovak Research and Development Agency at the Ministry of Education, Science, Research and Sport of the Slovak Republic



SLOVENIA

PARTNER INSTITUTIONS:

- Jožef Stefan Institute, Department of Environmental Sciences, JSI-O2
- Jožef Stefan Institute, Department of knowledge Discovery, JSI-E8
- National Institute of Biology, Department of Genetic Toxicology and Cancer Biology
- University of Ljubljana, Faculty of Medicine, Department of Public Health (UL FM, DPH)
- University of Ljubljana, Faculty of Pharmacy
- University of Maribor, Faculty of Medicine, Clinical Centre Maribor Clinic for Gynecology and Perinatology
- Chemical Institute, Theoretical Section, Laboratory for Chemical Informatics

National Node Contact Point

- Milena Horvat
- milena.horvat@ijs.si

JOŽEF STEFAN INSTITUTE, DEPARTMENT OF ENVIRONMENTAL SCIENCES



RESEARCHERS

Prof. Milena Horvat – group leader

Assoc. Prof. Tina Kosjek

Janja Snoj Tratnik

Dr. Darja Mazej

Dr. David Kocman

Dr. Anja Stajnko

Dr. Agneta A. Runkel

Dr. Žiga Tkalec

Dr. Ingrid Falnoga

DESCRIPTION

The [Jožef Stefan Institute](#) is the largest and leading Slovenian research organisation, and is responsible for a broad spectrum of basic and applied research in the fields of natural sciences and technology. The staff of around 960 specializes in research in physics, chemistry, biochemistry and materials, electronics and information science, nuclear technology, energy utilization, and environmental science. JSI was founded in 1949 as an institute for Physics within the Slovenian Academy of Sciences and Arts. Today it is involved in a wide variety of fields of both scientific and economic interest. In-house research has been reinforced by building strong links to universities, other research institutions, and industry.

The [Department of Environmental Sciences](#) focuses on multidisciplinary research with emphasize on combination of physical, chemical and biological processes that influence the environment, man and human activities, including human health risk and environmental impact assessments. DES coordinates and participates in [numerous national and international projects](#) in the field of environmental sciences and environmental health. DES implements and coordinates activities related to HBM in Slovenia. DES has a status of [Designated Institute](#) for the amount of substance (mol) in the National metrology system and is active in EURAMET and BIPM Committees. Coordination of national projects (2016-current): (i) P1-0143 Cycling of substances in the environment, mass balance and modeling of environmental processes and risk assessment (ii) V3-1640 Exposure of children and adolescents to selected chemicals through their habitat environment (iii) N1-0047 Bisphenol A alternatives: transfer from food contact material, fate and human exposure (iv) J7-9400 Neuropsychological dysfunction caused by a low level of exposure to toxic metals. DES is also active in [participatory science](#) and [ERACHair Iso-food](#), which deals with food safety, traceability and security issues.

INFRASTRUCTURE

Clean laboratories, lab safety procedures, QA system with accredited laboratories and certified for handling biological materials. Instrumentation: Mass spectrometry: UPLC-qTOF-MS/MS, ICP-MS, ICP-MS QQQ, LA-ICP-MS, LC-ICPMS, GC-ICP-MS, SP-ICP-MS, GC(IT)MS, GC-MSD, LC-MS/MS; Spectrophotometry: HG AFS, CV AFS, CV AFS , Raman spectroscopy; Isotope ratio mass spectrometry: EA-IRMS, GC-C-IRMS, DI-IRMS, Py-IRMS, MC-ICP-MS; Nuclear methods: TRIGA MARK II nuclear reactor, alpha, beta and gamma counting; Access to JSI research infrastructure: Protein structures and Electron Microscopy Center with state of the art equipment. The research facilities are an integral part of the DES and include the Center for Mass Spectrometry. Recently additional new premises of 700 m² funded by EU structural funds has been inaugurated including especially designed human biomonitoring biobank and new training facilities.

In the field of microbiome analyses: Nanopore sequencing devices; cell desintegrators; PCR, qPCR; necessary computer power for bioinformatic analysis with prepared bioinformatics pipelines, HPC (če je vključen Dzeroski); impactors (tukaj bi morali še kakšnega kupiti, ker bomo potrebovali multistage Andersen impactor, imamo pa enostavna dva prenosna, ki nista multistage); fluorescent microscope; flow cytometer; particle analyzer; necessary equipment for cultivation of microbes (incubators, shakers, autoclave, etc.)

NATIONAL INSTITUTE OF BIOLOGY, DEPARTMENT OF
GENETIC TOXICOLOGY & CANCER BIOLOGY



Researchers:

Assoc. Prof. Bojana Žegura – group leader

Assist. prof. Alja Štern

Dr. Martina Štampar

Dr. Metka Novak

Dr. Barbara Breznik

Dr. Tina Eleršek

Dr. Jelka Pohar

Dr. Anže Smole

DESCRIPTION

National Institute of Biology is a public non-profit organization performing basic and applied research in the fields of biology, ecology, biotechnical sciences and biotechnology, medicine, and systems biology. Department of Genetic Toxicology and Cancer Biology conducts research in ecotoxicology, genetic toxicology and cancer biology and is one of the pioneers in the application of alternatives to animal models in this field, linking novel advanced 3D cell models and assessment of chemical hazard for human and environmental risk and exposure. The research focuses on the understanding of the complex mechanisms through which the environment impacts the health of people, and vice versa, how human activities impact the environment. *We study molecular mechanisms of toxic and genotoxic effects of environmental pollutants as individual compounds as well as complex mixtures on human health and aquatic organisms. Research also includes ecological studies of surface waters and development of new methodologies for ecological assessment of water*

quality based on environmental DNA analysis in water bodies. Furthermore, the department conducts basic and translational research in the field of cancer biology and searching novel treatment options for aggressive cancers, such as brain tumours glioblastoma. Cancer research is focused on identification of novel biomarkers to better predict the prognosis of brain tumours and novel treatment targets related to treatment resistance and tumour microenvironment using state-of-the-art technologies. In the field of Immunology and Cellular Immunotherapy, we focus on fundamental immunology and development innovative next-generation cellular immunotherapies with improved efficacy and/or safety.

INFRASTRUCTURE AND EQUIPMENT

Cell cultures and cell biology laboratories

CO2 incubators, centrifuges, laminar flow hoods, -80°C freezers, Countess automated cell counter (Thermo Scientific, Waltham, USA), RT PCR system 7300, digestoriji, balance, thermomixers, containers for storage of cell lines in liquid nitrogen etc.

Fluorescent microscopy

Fluorescent microscope (Nikon Eclipse 8000; Nikon Eclipse Ti), Fluorescent inverted microscope (Olympus IX70) and Microscope Olympus CKX41 and Olympus Provis AX70 fluorescence microscope (Olympus, Tokyo, Japan), EVOS7000 Imaging System-fully automated microscope for fluorescent and colorimetric image acquisition and large data processing, Metafer Metasystems (Scanning and Imaging Platform) all equipped with hardware and software for image analysis.

Confocal microscopy

Confocal microscopes: Leica TCS SP5 laser scanning confocal microscope mounted on a Leica DMI 6000 CS inverted microscope and confocal microscope Leica SP8 TCS with light-sheet microscopy module. All equipped with hardware and software for image analysis.

Flow cytometry, spectrofluorimetry and luminometry

MACSQuant analyser 10 flow cytometer (Miltenyi Biotech, Germany), spectral flow cytometer Cytek Aurora (Cytek Biosciences, Fremont, USA). Equipped with software for data analysis.

Spectrofluorimetry and luminometry

Spectrophotometer SynergyMx, (BioTek (Agilent), USA) and Spectrophotometer NanoDrop, Cytation 5 Cell Imaging Multi-Mode Reader (BioTek (Agilent), USA), and Luminometer Synergy HTX (BioTek (Agilent), USA).

Laboratory for nucleic acid research

RT-PCR (Real time PCR; LightCycler 480 (Roche), Viia 7 and QuantStudio 7 Flex Real (Applied Biosystems), qPCR cyclers ABI 7900 HT and ABI 7900HT Fast Sequence Detection System (Applied Biosystems), Droplet Digital PCR system QX100 and QX200 (BioRad), nanofluidic digital PCR; BioMark System (Fluidigm).

Laboratory for proteomics

ODYSSSEY Infrared imaging system for quantitative Western blot analysis (LI-COR, Lincoln, USA), high transfer efficiency western (iBlot 2 Dry Blotting System, Invitrogen) and

transilluminator (UVP ChemStudio PLUS, Analytik Jena).

Laboratory Biosafety Level II (BSL II)

Fully equipped cell and molecular laboratory that allows handling and working with the organisms that are classified as GSO BSL II and primary human tissues and other human biological material.

X- ray irradiator

Precision X-Ray, CellRad+ irradiator enables the irradiation of cell culture without the use of radioactive elements. Irradiation is safe, fast and cost-effective alternative to gamma Radioisotope.

Equipped laboratories for breeding, maintaining and working with zebrafish (*Danio rerio*) and algae/ cyanobacteria

Techniplast system; aquaria for fish, traps for embryos, filters, pump; microbiological protection chamber; observation chamber Danio Vision (Noldus, the Netherlands); invert microscope Nikon Eclipse TE300 equipped with digital camera for analyses; incubators and illuminated climate chamber with shakers (FDM, Italy).

UNIVERSITY OF LJUBLJANA, FACULTY OF MEDICINE,
DEPARTMENT OF PUBLIC HEALTH (UL FM, DPH)



University of Ljubljana

Assoc. Prof. Dr. Andreja Kuvec

Members of the research group at DPH have extensive experience and numerous references in the field of risk factors for the burden of chronic non-communicable diseases in Slovenia. In the methodology of linking health and environmental data, Assoc. Prof. Dr. Kuvec and her colleagues are leading researchers in the Slovenian context. Within the SLORapro program, we also assess the effects of waste incineration and co-incineration on the burden of cancer in a model area. Additionally, Assoc. Prof. Dr. Kuvec collaborates with clinical medicine specialists to mentor doctoral students in establishing an interdisciplinary consortium covering the impact of environmental risk factors on chronic non-communicable diseases (respiratory diseases in children and adolescents, sleep indicators in adolescents, assessment of dietary and behavioral risk factors in peri- and post-menopausal women, allergic reactions to insect stings in the Slovenian beekeeper population, and environmental inequalities).

Prof. Marija Sollner

Prof. Janja Marc

Faculty of Pharmacy (UL FFA) is the leading research and higher educational institution in the field of pharmacy, clinical biochemistry, toxicology and cosmetology in the region. The mission of the Faculty is to foster an environment supportive of education, research and service in order to promote the discovery, development and the appropriate use of medicines. We develop expertise in development of biomarkers, cell biology, molecular pharmacology and toxicology; *in silico* drug design, synthesis and evaluation of lead molecules/drug candidates *in vitro*; PK/PD modelling; development and validation of analytical and bioanalytical methods; formulation design; solid-form prototype development, advanced drug delivery, nanotechnology and phytopharmacy.

UL FFA has 1,400 students and approx. 150 teaching and research staff. UL FFA is strongly involved in basic and applicative research, financed by the government (68%), the pharmaceutical industry (21%), and EU projects (11%). UL FFA has excellent long-term research collaborations with the pharmaceutical industry, which has resulted in numerous international patent applications and patents. The UL FFA has valuable experience in managing large research EC projects: in the 6th FP (INTAFAR and CANCERDEGRADOME), in the 7th FP (NANOPHOTO and MAREX) and H2020 (MC-ITN) (<https://www.ffa.uni-lj.si/en/research/projects>).

INFRASTRUCTURE

Laboratories at the Faculty of Pharmacy (UL FFA) are fully equipped with instrumentation for organic synthesis, analysis of synthetic products and PADMET evaluation: NMR spectrometer Bruker AVANCE III 400 MHz; Microplate reader TECAN Sapphire II; Multi-Mode Microplate Reader (SINERGY H4) and robot for automatic pipetting (PRECISION XS); EliSpot/FluoroSpot Reader, ELR08IFL; Nano ITC system for microcalorimetry TA Instruments; FT-IR spectrometer Perkin Elmer Spectrum BX; Polarimeter Perkin-Elmer 241 MCHPLC Agilent Technologies 1100 ;Gass chromatograph with mass selective detector Shimadzu GCMS-QP2010 Ultra; Ultra HPLC with triple quadrupole tandem MS spectrometer (UHPLC/MS/MS) Agilent 6460; Chromatographic system ÄKTAexplorer 10 S

82.427 Thermo Vanquish Duo UHPLC system with double LC s Corona™ Veo™ RS Charged Aerosol detector (HRMS compatible); High resolution mass spectrometer HPLC-HRMS Exactive Plus Orbitrap Mass Spectrometer – Thermo (resolution 140.000) coupled with UHPLC Thermo Ultimate 3000; HPLC-MS Advion CMSL single quadropol (coupled with HPLC 1260 InfinityII and Advion reader for TLC-MS); UHPLC-MS Agilent 6545XT AdvanceBIO Q-ToF (coupled with 1290 Infinity II), Thermo Vanquish Duo UHPLC system with double LC s Corona™ Veo™ RS Charged Aerosol detector (HRMS compatible); UHPLC Thermo Ultimate 3000; Workstation with two 14-core Intel Xeon Gold 5120, 48 GB RAM-a, 1 TB SSD, 8 TB HDD in graphic card RTX 2080 Ti 9.000 (structure-based drug design software: Autodock, FlexX, Gold, eHiTS, ROCS, etc.); Imaging flow cytometer, Amnis ImageStreamX Mk II; BD FACSCalibur Flow Cytometer; Flow cytometer Attune NxT, Life Technologies; Raman Spectrometer - Confocal Raman Atomic Force Microscope XploRA PLUS-OmegaScope; Confocal mycroscope Axio Observer Z1; Next generation sequencer, MiSeq, Illumina 141.925 Sequencer, Genome Lab GeXP, Beckman Coulter 95.302 qPCR system, Light Cycler 480, Roche 47.439 qPCR system ABI PRISM Nucleic Acid PrepStation 80.652 Automated Platform for Live Cell Imaging; Transgenomic WAVE MD dHPLC SISTEM Plus; Biobanking system, Arpege, PHCBi; Biotage Isolera flash chromatograpy system; Parr 4560 mini bench top reactor; Chromatotron 7924T Harrison Research circular chromatography system; Discover (CEM Corporation) microwave synthesis system.

The Faculty of Pharmacy also has three fully equipped cell laboratories.

The researchers have direct access to the equipment, infrastructure and expertise of two infrastructure centers operating at the Faculty of Pharmacy: EATRIS Slovenia (<https://www.ffa.uni-lj.si/en/faculty/organization/Infrastructural-centres/eatris-slovenia>) and Infrastructural Center for Drug Analysis (<https://www.ffa.uni-lj.si/en/research/research-equipment/0/infrastructural-center-for-drug-analysis>).

UNIVERSITY OF MARIBOR, FACULTY OF MEDICINE, CLINICAL
CENTRE MARIBOR CLINIC FOR GYNECOLOGY AND
PERINATOLOGY



The Faculty of Medicine at the University of Maribor (MFUM) is a respected institution for education and research, dedicated to its primary goal of providing students with the knowledge and skills needed for disease prevention, health maintenance, and well-being restoration. In pursuit of this educational mission, MFUM actively engages in a broad spectrum of research projects aimed at fostering the harmonious and sustainable development of individuals and society as a whole. The institution's core values and guiding principles are deeply embedded in its identity, leading to an unwavering commitment to serving as an open and high-quality educational center, promoting the highest ethical

standards, continuously striving for excellence, nurturing collaborative partnerships with all stakeholders, and upholding the cherished principle of academic freedom.

RESEARCHERS

Dr. Uroš Maver, Dr. Božena Pejković, Dr. Andraž Stožer, Dr. Uroš Potočnik, Dr. Iztok Takač, Dr. Sebastjan Bevc, Dr. Maja Rupnik, Dr. Erika Zelko, and Dr. Matjaž Vogrin,.

EQUIPMENT

NGS system MiSeq (Illumina), Real-time PCR system QuantStudio 12K Flex (Life Technologies), Quality control system (Agilent 2100 Bioanalyzer), Gradient, Trio, and standard thermocyclers, Roche LightCycler LC 480 real-time PCR instrument (2166) with a 384-Well Block for qPCR (LC480 Roche), Thermomixer, QIAcube System for DNA, RNA, and protein isolation, Horizontal electrophoresis for agarose gel, Microplate reader Synergy2 (BioTek), Gel imaging system GBOX, Automated protein incubation system WB BenchPro, Membrane blocking system, Fluorescence microscope FLOID, Analytical balance, Real-time PCR cycler RotorGene Q, Anaerobic workstation A35 (DonWhitley Scientific), Microarray optical scanner Agilent, Microarray optical scanner Illumina (access through collaboration with the University of Groningen), Real-time PCR LightCycler (Roche) with software for qRT expression analysis and high-resolution melting for genotyping and mutation detection, Next-Generation Sequencing (NGS) system (Illumina) (access through collaboration with the University of Groningen), Flow cytometer, Confocal microscopy, Automated sequencer ABI310, Automated immunohistochemistry (Ventana).

Additional tools provided by the Pharmacological Laboratory include UV/VIS spectrophotometer Cary 50, Spin coater (Polos MCD), Optical emission spectrometer (ICP-OES) Agilent 5110 VDV, SEM Zeiss Gemini supra 35 VP, Microscope AxioTech 25 HD, and high-resolution camera AxioCam MRc (D), Zeiss, HPLC 1100 Hewlett Packard, Synergy H4 hybrid multimodal microplate reader (BioTek), fluorescent inverted microscope Axio Observer Z1 (Carl Zeiss), automated Franz-diffusion cell system (Logan Systems), Life Technologies EVOS® FLoid® Cell Imaging Station - fluorescent microscope, inverted light microscope Leica DMI6000 B with DFC365 FX camera, cell culture incubators (Panasonic, Binder, Sanyo), Amnis ImageStream - imaging flow cytometer, 3D printer ViatPrint, Merck Millipore cell analyzer (Muse®), atomic force microscopy Keysight Technologies 7500 AFM, Immunological analysis (Roche Cobas e 111), Biochemical analysis (Roche Cobas c 111), Hematological analysis (Siemens ADVIA), FACSAria III SOR.2B/3R/2BV/5YG-2nUV (BD Biosciences) cell sorter, Leica TCS SP8 confocal microscope, JEM 2100 Plus HC LaB6, 200kV TEM, ZEISS Xradia 620 Versa NanoCT, Illumina NextSeq 550 sequencing system, SCIEX Triple Quad, SCIEX TripleTOF MS/MS.

Dr. Marjan Vračko

RESEARCH ACTIVITIES

The research topic covers the hazard assessment of chemicals for the environment and humans. This includes industrial chemicals, chemicals encountered by users, and pharmaceuticals. In the EU, this area is regulated by the REACH legislation (Registration, Evaluation, Authorization of Chemicals). We use various computer modeling methods for this assessment, including QSAR modeling, quantum chemistry, molecular dynamics, and chemometrics. Our goal is to assess the potential danger of chemicals based on their chemical structures. This field is of interest to chemical market regulators (ECHA, EFSA, US-EPA, the Chemicals Office of the RS, etc.) and researchers investigating toxicity mechanisms. In scientific and professional environments, it is expected that the next generation of models for toxicological property assessment will include information not only about the molecule's structure but also about its interaction with biological subsystems (Adverse Outcome Pathways - AOP). One of the initial steps of a compound's effect on an organism is its binding to a potential receptor (Molecular Initiating Event - MIE), where computer modeling plays a central role.

RESEARCH INFRASTRUCTURE

Ažman Computational Center ARC (High-performance computing center at NIC - Center for High-Performance Computing at CI) High-performance computing (HPC) involves the use of supercomputers and parallel processing techniques to solve complex computational problems. HPC technology focuses on developing algorithms and systems for parallel processing, with a significant emphasis on administrative approaches and parallel processing techniques. HPC enables the resolution of advanced problems and the execution of research activities through computer modeling, simulation, and analysis. The system is equipped with necessary software for molecular modeling, including AMBER, Blender, CHARMM, Cuda, Discovery Studio, Quantum Espresso, Gaussian 16, Gnuplot, Goldsuite, Gnuoctave, Gromacs, Miniconda, Molaris, Molden, NAMD, Ocaml, Orca, perIMol, Python, Q, R, Relion, Scalapack, VASP, VMD, programs for descriptor calculations (ALVAdes, Dragon, PolyMol), and QSAR modeling, as well as in-house programs for neural network modeling and data processing. Data is primarily sourced from publicly accessible databases (ToxCast, CoSing, ECHA, EFSA, and OECD databases).

STAKEHOLDERS

EXTERNAL STAEKHOLDERS

Policy

- National Institute of Public Health (NIJZ)
- National Laboratory of Health, Environment and Food (NLZOH)
- OI – Cancer Registry. Collaboration
- Ministry of Health (MZ), and Chemical Office of the R Slovenia (CORS)
- Ministry of the Environment and Spatial Planning (MOPE) and Environmental Agency
- Ministry of Economy and Natiopnal Metrological Institute
- Ministry of Agriculture and Forestry, Institute for Agriculture and national institute for food safety

NGOs

- Institute of Health and Environment;
- Youth Association for Sustainable Development
- Science on the Street

Industry

- CUDHg, Idrija
- Cement production, Salanit Anhovo
- Nuclear Power Plant, Krško
- UNIOR, Zreče



SPAIN

INTRODUCTION

The Spanish Node of the pan-European Research Infrastructure (EIRENE) results from an agreement between the Institute of Environmental Assessment and Water Research (IDAEA) from the Spanish Council for Scientific Research (CSIC) in Barcelona, the Institute of Global Health (ISGlobal) in Barcelona, the National Center for Environmental Health of the Carlos III Health Institute in Majadahonda-Madrid, the Foundation for the Promotion of Research in Health and Biomedicine of the Valencian Community (FISABIO) in Valencia, the Biodonostia Health Research Institute in San Sebastian, the Foundation for Biosanitary Research and Innovation of the Principality of Asturias (FINBA) of the University of Oviedo in Oviedo, the Center for Biomedical Research of the University of Granada in Granada and the Institute of General Organic Chemistry (IQOG) from CSIC in Madrid.

National Node Contact Point

- [Joan Grimalt](#)
- joan.grimalt@idaea.csic.es

This Spanish Node aims to offer the necessary tools and services to characterize environmental and human exposure to chemical contamination and its potential health effects, including through the holistic concept of exposome. This Node will leverage the European ESFRI project EIRENE to establish a state-of-the-art infrastructure for groundbreaking research on environmental contaminants and the human exposome. This activity will result in an enhanced use of existing experimental capabilities (monitoring and biomonitoring programs, cohorts, laboratories, samples and available data), as well as bioinformatics, biostatistics and modeling capabilities of the node members themselves and as a contribution to the research developed in the European context. The consortium will promote scientific excellence, share available facilities, samples, data, knowledge and expertise. The node's overarching aim is to provide the advanced infrastructure needed to perform next-generation exposome studies aimed at deciphering the possible causal associations between various exposures throughout life and their relationship with health effects and to understand the mechanisms that determine them. It will also promote industrial competitiveness and enable the synergistic and harmonized development of geographically balanced research and training capabilities within Spain and among the countries of the European Union. Partners in this node are leading Spanish institutes in human biomonitoring, environmental monitoring, epidemiology, exposome research, toxicology, hazard and risk assessment and they participate in a large variety of exposome projects.

RESEARCH FOCUS

Most of the members participating in this node have a consolidated expertise the study of how environmental pollutants influence on child development from birth to adulthood. The studies include families living in different socioeconomic and environmental areas of Spain, with exhaustive follow-ups both for the extensive environment measurements, questionnaire data, and physical

and neurodevelopment evaluations at different time-periods. The node's overarching aim is to provide the advanced infrastructure needed to perform next-generation exposome studies aimed at deciphering the possible causal associations between various exposures throughout life and their relationship with health effects and to understand the mechanisms that determine them. This node will provide a valuable platform to bridge the gap between the fields of environmental and health sciences, to eliminate fragmentation and to enable more efficient exploitation of available resources and knowledge to improve risk assessment, chemical management, evidence-based regulation and sound policy formulation, thus providing better health citizen protection.

CONSORTIUM MEMBERS

INSTITUTE OF ENVIRONMENTAL ASSESSMENT AND WATER
RESEARCH (IDAEA) FROM THE SPANISH COUNCIL FOR
SCIENTIFIC RESEARCH (CSIC)



IDAEA-CSIC has a solid record of leading research on the development of analytical methods for the analysis of trace organic pollutants and metals. In October 2019, IDAEA was named a Severo Ochoa Centre of Excellence by the Spanish State Research Agency, in view of the high scientific profile of this Institute in analytical chemistry and environmental sciences. The members of IDAEA have a strong expertise in gas and liquid chromatography coupled to mass spectrometry. These methods are used for the analysis of organic pollutants and metals of environmental or toxicological concern that are present in air, water, sediments, soils and organisms as well as in human fluids. This activity concerns the environmental processes determining the distribution of polar and apolar organic compounds, volatile and non-volatile, and involves the development of advanced analytical methods to afford information on relevant geochemical or toxicological processes. Among the latter, methods for the analysis of organohalogen compounds, plastic derivatives, atmospheric pollutants, organophosphate pesticides, pyrethroids, bisphenols, PFAs, glyphosate and their metabolites, as well as metals of environmental/toxicological interest, e.g. mercury, arsenic, antimony, copper, cadmium, cobalt and others, have also been implemented using inductively coupled plasma-mass spectrometry. Suspect analysis and non-target analysis of human and environmental samples are also routinely performed in the Institute using the high-resolution mass spectrometry instruments, such as the Q-Exactive Orbitrap coupled to liquid and gas chromatographs.

In addition, the Institute assesses contaminants' degradation and metabolism in different types of matrices to further deal with their bioaccessibility, bioaccumulation and biomagnification through the food web of contaminants in biota and humans. This activity involves field sampling and monitoring which have been carried out in very diverse areas, including remote (Antarctica, Greenland, Arctic zones, high mountains) and local sites (rivers, crops, cities).

The Institute performs research in the sectors of air quality, aerosols and climate, exposure, industrial emission, and waste. Research on air quality aims at understanding the chemical and physical processes responsible for the emission, transport, fate, and removal of atmospheric pollutants with an impact on human health and vegetation. The Institute is specialized in air quality

assessment and monitoring, using state of the art air pollutant instrumentation combined with innovative monitoring strategies based on sensor networks, and has strong expertise in source apportionment and health impact assessment to translate air pollution impacts into premature mortality and morbidity outcomes. Some of these activities are developed in collaboration with stakeholders and policy makers to address policy gaps and to provide external expert support to environmental authorities.

In Toxicology, the Institute is devoted to the study and assessment of the bioavailability and toxicity of existing and emerging contaminants and their mixtures. An array of lab toxicity tests (i.e. transgenic yeast, cell lines, zebrafish and *Daphnia magna* models), and field assays conducted with feral fish and invertebrates from both marine and freshwater environments are available. Effects are assessed across different biological levels using transcriptomic, lipidomics, metabolomics, morphogenetic and specific cell response, including effects on whole organism and population.

The Institute also has significant experience in developing and applying multivariate data analysis tools for the evaluation of large and complex datasets (big data). Data analysis approaches for exploration (principal component analysis, multivariate curve resolution), statistical assessment (multivariate ANOVA-based methods), calibration (partial least squares-based methods, machine learning methods) and data fusion are available. In particular, for the analysis of data from environmental and clinical studies. These studies are able to characterize primary contamination sources of specific environmental compartments (air, water, soil, biota) or geographical areas and to identify potential pollutants related to diseases. The personnel of the institute have consolidated expertise on the use of ArcGis programs and statistics with the R package.

SERVICES & FACILITIES

Advanced instrumentation and expertise for analysis of trace organic pollutants and metals in human and environmental samples. Availability of sampling methods for air, water, sediments, soils and organisms. Air samples include particles, the gas phase and the volatile organic pollutants. The analysis methods for human samples include venous blood serum, cord blood serum, urine, meconium, hair and saliva. The developed analytical methods are adequate for dealing with large numbers of samples. Target, suspected and non-target analytical methods are available. The group regularly participates in intercalibration exercises organized by diverse international agencies. The Institute is also expert in statistical analysis methods for the evaluation of the generated databases.

Prof. Joan O. Grimalt (male). PhD in Chemistry from the Autonomous University of Barcelona (1983). Postdoctoral stages: Oregon State University (1983-84), University of Bristol (1985). Full Professor of the Spanish Council for Scientific Research (CSIC) since 1992. Director of the IDAEA (2007-2018) and the Center for Research and Development (2011-2018) both from CSIC. Research devoted to the study of natural and anthropogenic compounds as markers of the health status of ecosystems and organisms (including humans). Publication of 760 papers (610 of them included in the SCI), some of them in high impact journals such as *Lancet* (1999), *New England J. Med.* (1989; letter), *Nature* (1990), *Science* (2004, 2007, 2021, 2023), *Rev. Geophysics* (2016), *Am. J. Resp. Crit. Care Med.* (2012), *Nature Geoscience* (2013), *Eur. Resp. J.* (2012), *Nature Communications* (2018), *J. Allergy Clin. Immunol.* (1991), *PNAS* (2012). These publications have received 30,500 citations. H index = 87 (source Scopus; November 1, 2023). Supervision of 53 PhD thesis and 79 master thesis to completion. He is included in the list of Essential Science Indicators of the ISI Web of Science in Environment/Ecology. He has participated in 125 research projects (48 funded by the European Union) having coordinated 59 of them. More information in <http://www.cid.csic.es/homes/grimalt>.

The Barcelona Institute for Global Health (ISGlobal) is a cutting-edge institution for research, education and innovation and one of the larger research centres in Global Health in Europe with more than 469 members from 35 different countries. In October 2019, ISGlobal was named a Severo Ochoa Centre of Excellence by the Spanish State Research Agency, turning the Institute into the only centre in epidemiology and global public health accredited with this distinction.

ISGlobal approach is multidisciplinary, ranging from the molecular to the population level and including disciplines across health sciences, life sciences, environmental, social, economic and climate sciences. The Institute's research on lifestyle and environmental risk factors in terms of conditions with long latency period and expertise in simultaneous assessment of multiple exposures has enabled a systematic approach to unravel the complex pathways affecting the health topics targeted in this project. ISGlobal has a leading role in the European Human Exposome Network (<https://www.humanexposome.eu/>) and is leading the newly funded International Human Exposome Network (IHEN) Project, which aims to improve global research and cooperation on the exposome by establishing an international exposome network.



EXPOSOME RESEARCH EXPERTISE

- Internal exposome, chemical exposures, endocrine disruptors.
- External exposome, urban environment (e.g. air pollution, noise, built environment including green spaces), GIS-based exposure characterization, and modelling and measurement of exposures.
- Working-life exposome, harmonisation of occupational exposure assessment throughout Europe (EuroJEM).
- Biological responses/internal exposome through omics technologies, epigenetics, transcriptomics, inflammatory proteins, allostatic load, accelerated ageing, gut microbiome, metabolomics.
- Cohort implementation and harmonization: mega-cohorts for occupational health, longitudinal mother-child cohorts, adult cohorts, mega-cohorts from administrative data.
- Exposure and health: mental health and neurodevelopment, cardio-metabolic health, obesity, respiratory health.
- Bioinformatics for multi-omics integration, federated data analysis (analyses when data are stored on federated databases or, more generally, in different repositories, e.g. Datashield).
- Advanced data modelling for exposure mixtures and causal inference.
- Characterization of the air from urban and rural environments: determination of physical properties of particles (from coarse to ultrafine particles), analysis of chemical (metals, non-metals, etc.) and biological (bacteria, fungi and viruses) composition.



SERVICES & FACILITIES

CORE DATA PLATFORM

Offers access to **unique longitudinal data and biosamples** across the life course and in vulnerable populations in Spain and Europe suitable for exposome research including biological sampling protocols, available address data, periodic health examinations, health outcomes and exposure datasets already collected as detailed below:

- **INMA:** Ongoing longitudinal birth cohort data on disease determinants, biological responses, biological samples, and child health outcomes from conception to early adulthood. Recruitment of pregnant mothers (N=3800): 1997-2008. Coverage: 7 regions of Spain. Uniqueness: long-term follow-up, in depth environmental data, detailed child health examination data (every 2-3 years), biological samples, and data on biological responses, genetics, and omics.
- **BiSC:** Ongoing longitudinal birth cohort data on disease determinants, biological responses, biological samples, and fetal and child health outcomes. Recruitment of pregnant mothers (N=1200): 2019-2021. Coverage: Barcelona. Uniqueness: novel and in-depth fetal and maternal health outcomes during pregnancy (placenta function, fetal imaging, ...), fetal biometry, placenta samples and placenta omics (DNA methylation, transcriptomics, ...), personal monitoring data, environmental data, child neuropsychology data.
- **HELIX:** Exposome cohort in 6 countries with repeated data on a wide range of exposures (chemical, lifestyle, social, urban), multi-omics data (epigenome, transcriptome, metabolome, proteome, microbiome/metagenome, genome), and health outcomes in children and adolescents. Recruitment of pregnant mothers (N=1660 subcohort; N=30,000 entire cohorts): 2003-2008. Coverage: Spain, UK, France, Lithuania, Greece, Norway. Uniqueness: exposome cohort with repeated exposure-omics-outcome measures.
- **ECHRS-Spain:** Population-based adult cohort with repeated data on disease determinants, biological responses, biological samples, and adult respiratory and allergy health outcomes from early to late adulthood. Recruitment of young adults (20-40 years, n≈2000) and follow-ups every 10 years (up to 4 till now). Coverage: 5 regions of Spain. Methodology fully harmonized with ECRHS-international covering 35 regions from 15 countries (n=16,000). Uniqueness: repeated respiratory and allergy data starting in the 90s, in depth environmental data, and data on genetics, and omics.

GIS (GEOGRAPHIC INFORMATION SYSTEM) FACILITY

The GIS facility is responsible for the processing and analysis of geographic data, is able to process large volumes of data efficiently. They can perform analyses of proximity and accessibility indices, individual exposure to environmental factors, relationships between urban design and physical activity and walkability, among many others.

AIRLAB

promotes research and innovation in the characterization of the chemical and biological composition of air and its effects on human health. It offers a wide range of services to provide scientific and technical support in air quality monitoring, air sampling and (bio)aerosol analysis of both indoor and outdoor environments.

Prof. Martine Vrijheid (female, 1970) (H-index: 83) leads the Programme of Environment and Health over the Lifecourse at the Institute of Global Health (ISGLOBAL) and holds a position at University Pompeu Fabra in Barcelona. She previously held positions at the London School of Hygiene and Tropical Medicine and the International Agency for Research on Cancer. As environmental epidemiologist, her research is driven by the need to protect vulnerable population groups, in particular children, from the harmful effects of environmental (chemical, physical and social) exposures. She has a demonstrated record of international leadership in child health, environmental pollutants, and exposome research, leading EC-FP7 projects CHICOS (Developing a Child Cohort Strategy in Europe; 2010-2013, €2.5M) and HELIX (Human Early Life Exposome; 2014-2018, €8.6M), and H2020 project ATHLETE (Advancing Tools for Human Early Lifecourse Exposome Research and Translation; 2020-2025, €12M). Through these and many other projects, she spearheaded the study of exposome and multi-omics determinants of child health, and was instrumental in building a network and data infrastructure of >30 birth cohorts in Europe. She (co-coordination with Prof Vermeulen from UU) was recently awarded a new Horizon Europe project (Coordination and Support Action) to establish the International Human Exposome Network (IHEN).

Dr. Léa Maitre (female, 1989, H-index: 24) is an assistant research professor and coordinator of the Exposome Hub at ISGlobal, promoting innovation, collaboration and communication about this new field of research. During her Ph.D. at Imperial College London (UK) she obtained extensive experience on metabolomics and pregnancy outcomes, acquiring broad knowledge in system biology, advanced statistical methods and epidemiology. Since then, she has focused on the extension of this field in the Exposome. Her participation in European projects on this topic included the scientific coordination in the HELIX project (2013-2018), as a task leader in the ATHLETE project (2020-2024) and co-PI in the International Human Exposome Network project (2024-2026). Her main research interests are in the application of interdisciplinary research (omics, environmental epidemiology, toxicology) to understand early life environmental influences on health and biological mechanisms. She is the coordinator of the yearly exposome summer school at ISGlobal and has been actively involved in conducting courses and workshops on advanced exposome tools and methodologies across the world (e.g. Exposome bootcamp in USA).

NATIONAL CENTER FOR ENVIRONMENTAL HEALTH (CNSA) OF THE
CARLOS III HEALTH INSTITUTE. MAJADAHONDA-MADRID



The CNSA is the scientific-technical body of the Instituto de Salud Carlos III, specialized in health aspects derived from environmental pollution. It contributes to the protection of the health of the Spanish population by assessing their exposure to environmental pollution. The CNSA laboratories operate under a quality system and are accredited as testing laboratories by the Spanish National Accreditation Entity (ENAC).

It houses the National Reference Laboratory for Air Quality, providing traceability and assuring the quality of the measurements of the Spanish air quality networks. It is also the laboratory designated by the Spanish Metrology Center as the depositary of the National Ozone Standard, providing traceability to the ozone measurements of the Autonomous Regions' networks and accredited

calibration laboratories. It is also the laboratory authorized by the Nuclear Safety Council (CSN) for external Personal Dosimetry in radioactive facilities.

The CNSA's objectives focus on the assessment of external and internal exposure of the population to pollutants to characterize the risks to human health derived from the environment. These aspects include:

- a) Analysis of chemical contaminants and/or their metabolites in human samples (blood, urine, etc.). This approach is an integrated assessment, taking into account all possible routes of exposure: inhalation, ingestion and contact.
- b) Dosimetry of personnel professionally exposed to ionizing radiation as a laboratory authorized by the Nuclear Safety Council, including evaluation of personal exposure to atmospheric pollutants using personal dosimeters.
- c) Determination of the relationship between exposure/effect and deriving a quantitative estimate of the health risk. The CNSA experts are authorized by the European competent authorities (EFSA and EMEA).
- d) Analysis of chemical contaminants in ambient air, indoor environments, rainwater, surface water, discharges and effluents, soils and sediments. Measurement of radiocontamination (alpha, beta and gamma activity) in environmental and food samples. Evaluation of the adverse effects of chemical contaminants on bioindicator organisms in the aquatic and terrestrial environment by means of toxicity bioassays.

It is also a reference laboratory of WHO-Europe for the measurement of mercury in hair and cadmium in urine.

The CNSA is also a reference laboratory for radioactive control of food for export and import in compliance with European regulations in collaboration with the Foreign Health Service of the Ministry of Health, Consumption and Social Welfare.

SERVICES & FACILITIES

Analysis of trace pollutants and their metabolites in human samples. Dosimetry of professionally-exposed personnel to ionizing radiation. Determination of the relationship between exposure/effect and deriving quantitative estimates of the health risk. Analysis of chemical contaminants in ambient air, indoor environments, rainwater, surface water, discharges and effluents, soils and sediments. Measurement of radiocontamination (alpha, beta and gamma activity) in environmental and food samples. Evaluation of the adverse effects of chemical contaminants on bioindicator organisms in the aquatic and terrestrial environment by means of toxicity bioassays. Organization of intercalibration exercises

Dr. Ana Isabel Cañas (female). PhD on Environmental Sciences from the University of Alcalá (2009). Director of the CNSA since 2022. She has been Head of the Area of Environmental Toxicology of the Institute Salud Carlos III (2019-2023) and director of the Agrofood Laboratory of Santander from the Spanish Ministry of Agriculture (2018-2019). She has been organizing intercalibration exercises in this lab. Head of the Analytical Department of this lab in 2013-2019. Responsible of the Department of ICP-MS of this lab for the analysis of human samples in 2007-2013.

FISABIO is a nonprofit scientific and healthcare entity, whose primary purpose is to encourage, promote and develop scientific and technical health and biomedical research in the Valencia Region. It integrates and manages the Health Research Map of the Centre for Public Health Research, Dr. Peset University Hospital Foundation, Alicante University General Hospital Foundation, Elche University General Hospital Foundation, and the Mediterranean Ophthalmological Foundation. In addition, FISABIO assumes the scientific activity of other 18 Health Departments. FISABIO provides service to more than 1,500 healthcare professionals within the Valencia network, who are working in research and clinical trials.

The main objectives of the Institute are:

- To facilitate, promote, develop and execute research according to existing programs in the Valencia Department of Health.
- To act as scientific and technical research and innovation driving agent, providing the necessary basis to promote interaction between research teams.
- To facilitate and promote the training of professionals and researchers.
- To perform and promote studies that generate knowledge in the field of health care and health in general.
- To develop healthcare activities.

Concerning environment and childhood, FISABIO is devoted to the study of the relationship between the environment and maternal, infant and adolescent health, and the influence of diet and genetics in this association. In addition to environmental pollutants (air, water and diet) FISABIO also considers psychosocial factors (family environment and social inequalities) and epigenetic aspects (DNA methylation and telomere length). It is currently analyzing the relationship of all these factors with respiratory, cardiometabolic, mental, psychological, pubertal and gut microbiota development at different stages of childhood and adolescence. FISABIO is also concerned with the impact of social inequalities and its implications on physical and psychological health.

FISABIO also evaluates the relationship between climatic factors and meteorological variables, especially environmental temperature and health, as well as public health measures that can minimize the impact of foreseeable future climatic changes.

FISABIO is also concerned with the quality of life line in middle-aged women which involves the analysis of the different social, biological, lifestyle and health of middle-aged women, including topics such as vaginal health, human papillomavirus, cervical cancer and vaginal microbiota.

SERVICES & FACILITIES

Integration of the Valencia cohort in other Spanish and European mother/child cohorts for exposome research. Measurement of the atmospheric pollution in urban areas. Studies of the impact of environmental pollution on human health, e.g. effects of mercury on neurodevelopment.

Prof. Ferran Ballester (male). PhD in Medicine by the University of Alicante (1995). Professor of Nursing at the University of Valencia and researcher in FISABIO and CIBERESP (Public Health Epidemiology Biomedicine Research Center of the Institute of Health Carlos III). Specialist in Family and Community Medicine and Preventive Medicine and Public Health, Master in Public Health from the University of Valencia (1990). He worked in primary health care and Public Health until 1991 when he joined the Valencian Institute of Public Health (until 2009). He has been an associate professor at the Miguel Hernández University (1999-2004). His main lines of research are the study of exposure to environmental factors and its relationship with health, and especially in children.

BIODONOSTIA HEALTH RESEARCH INSTITUTE. SAN SEBASTIAN



Biodonostia preferentially boosts translational research focusing on the patient and the general population. It covers all research carried out in Gipuzkoa within the framework of the Basque Health Service and aims to improve people's health through its multi-institutional and interdisciplinary collaborative structure.

MAIN RESEARCH AREAS

- Environmental and atmospheric pollution, drinking water contamination, diet and health.
- Effects of interior and exterior atmospheric pollution and contamination of drinking water and for domestic use in neurodevelopment and respiratory diseases.
- Associations between pre-natal exposure and during the early years of life to pollutants such as persistent organic pollutants, endocrine disruptors and heavy metals, and neurobehavioural development in childhood.
- Development, application and/or adaptation of the different scales and testing to assess neurobehavioural and domestic aspects, school environment and other scales in childhood. Relationship of the aspects of the family structure and function, and cognitive development.
- Sociodemographic and health determining factors during pregnancy and early childhood.
- Obesity and metabolic disorder in childhood.

SERVICES & FACILITIES

Integration of the San Sebastian cohort into other Spanish and European mother/child cohorts for exposome research. Studies on the influence of environmental conditions in human health, e.g. influence of noise and sleep quality, mental health.

Dr. Jesús Ibarluzea (male). PhD. in public health by the University of the Basque Country (UPV/EHU). Biologist and Psychologist (UPV/EHU), MSc Environmental Health (Puerto Rico School of Public Health), Master's Degree in Environmental Engineering (UPV/EHU). He currently works at the

Gipuzkoa Sub-Office of Public Health and Addictions, Basque Government Ministry of Health and is Leader of the Epidemiology and Public Health Area and Head of the Environmental Epidemiology and Child Development Group. His activity is mainly focused on the effect of environmental factors, the physical and neuropsychological development of children and young people within the INMA Environment and Childhood project. He is a teacher of the Master's Degree in Public Health and of the Master's Degree in General Health Psychology while at same time directing several doctoral theses. Dr. Ibarluzea is a Collaborating Researcher of the UPV/EHU Faculty of Psychology and Principal Researcher of group 28 on Public Health at the CIBEResp (Carlos III Health Institute Network Centre of Biomedical Research in Epidemiology and Public Health). He has 140 publications in high-impact journals (>80% in Q1 and 66% in D1). H-index: 39.

FOUNDATION FOR BIOSANITARY RESEARCH AND INNOVATION OF THE PRINCIPALITY OF ASTURIAS (FINBA) OF THE UNIVERSITY OF OVIEDO



FINBA aims to promote, support, manage and disseminate research, scientific-technological development and bio-health innovation as factors of regional development, within the institutional policy objectives proposed by the Administration of the Principality of Asturias. It manages the Health Research Institute of the Principality of Asturias grouped around the Central University Hospital of Asturias, and the research and development of all the health centers dependent on the Health Service of this region. It is also involved in the management of knowledge and intellectual capital, intellectual property policies, patents, cooperation with investment companies and the raising of seed and risk capital for health studies. FINBA also supports active citizen participation, gender equality, scientific education, scientific ethics and integrity, and open access to scientific information.

SERVICES & FACILITIES

Integration of the Asturias cohort in other Spanish and European mother/child cohorts for the investigation of the exposome. Studies of the influence of diet on contaminant intake and health effects. Development of morphometric methods for the measurement of endocrine disruption effects in children. Study of metals and organic pollutants in the exposome of Asturias.

Prof. Adonina Tardón (female). PhD in Medicine and Surgery. Specialist in Preventive Medicine and Public Health. She belongs to the National Health Medical Corps and is Professor in the Area of Preventive Medicine and Public Health at the University of Oviedo. She has directed teaching in the Preventive Medicine and Public Health Area of the University of Oviedo since 2016. She has directed 24 research projects in cancer research programs (15) and Community Health Diagnosis (9). She has directed 9 final master's projects in Biomedicine and Molecular Oncology, Occupational Risk Prevention, and Emergency and Disaster Analysis and Management. In the last five years she has supervised 8 PhD theses in Community Health Diagnostics and Cancer Research. Two of them obtained the "Extraordinary Prize of the University of Oviedo", one of them with international mention. She has directed the Environmental and Molecular Epidemiology Group of the University of Oviedo (2000-present). She directs Group 53 of the Ciber of Epidemiology and Public Health (CIBERESP) (2007-present). She belongs to the CIBERESP Steering Committee (2011-present). She has published 266 scientific articles in journals of international impact which have received 5,785 citations (H index = 41), 1400 of them in bladder cancer, 300 of them in lung cancer and 1254 in environmental exposure and children health. She has carried out ten contracts with companies for

advice, and preparation of epidemiological reports and evaluations. Member of the Technical Presentation on Occupational Cancer Committee of the Principality of Asturias (2015-present).

CENTER FOR BIOMEDICAL RESEARCH (CBR) OF THE UNIVERSITY OF GRANADA



The CBR is integrated in the Health Sciences Technology Park (PTS) University Campus of the University of Granada, which houses the Faculty of Health Sciences and the Faculty of Medicine. It offers a cutting-edge combination of teaching, research, healthcare and knowledge transfer, consistently with the University's commitment to innovation and promotion of local and global partnerships with the public and the private sectors. It has state-of-the-art scientific and technical equipment for the chemical analysis of biological samples (mainly human) by means of directed and non-directed techniques. Its Chromatography and Mass Spectrometry Unit allows to analyse biomarkers of exposure in different biological samples (urine, serum, breast milk, placenta and adipose tissue).

One main achievement of the CBR has been the development of the following biomarkers of combined biological activity for elucidating the biological effect of CECs mixtures found in the samples:

- 1) E-Screen test based on MCF-7 cells proliferation
- 2) Estrogen receptor (ER) reporter gene assay, based on transfected human breast adenocarcinoma MVLN cells carrying the estrogen response element luciferase reporter vector
- 3) androgen receptor (AR) and aryl hydrocarbon receptor (AhR) reporter gene assays, using AR-EcoScreen and H4IIE-CALUX cell lines
- 4) Xenopus eleutheroembryonic thyroid assay (XETA) to detect disruption of thyroid hormone signaling through variations in the fluorescence emitted by transgenic tadpoles.

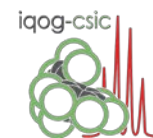
SERVICES & FACILITIES

Integration of the Granada cohort in other Spanish and European mother/child cohorts for the investigation of the exposome. Study of metals and organic pollutants in the exposome of Andalusia. Study of biomarkers of effect of priority pollutants. Non-targeted analysis and development of bioassays for effect identification.

Prof. Mariana Fernandez (female). She has published more than 160 papers in environmental health journals. She has also published 25 book chapters (11 international). These publications have received 5242 citations (Web of Science). H Index = 35. Participation in 5 research projects funded by US agencies and 7 by the EU. Collaboration in 18 Spanish projects (mainly of the ISCIII-FIS), in 3 of them as principal investigator. She has also participated in 11 projects of Autonomous Communities, in 3 of them as IP. Supervision of 14 PhD theses to completion, 2 of them receiving extraordinary awards. She has made continuous teaching activity as a collaborating, contracted, tenured teacher or professor, of regulated teaching (undergraduate, degree, postgraduate, doctoral programs and master) in official programs of the University of Granada, as well as in other National and international universities. Participation in teaching innovation projects, in pilot

experiences for the implementation of European credit and in support programs to the training of beginning teachers and improvement of teaching. Secretary of the Doctorate Program in Clinical Medicine and Public Health of the University of Granada; Member of the Management Committee of the Cohort “Childhood and Environment” (INMA); Member of the Spanish group of experts of the General Subdirectorate of Environmental Health and Occupational Health (Ministry of Health, Social Services and Equality) in the European Commission for endocrine disruption.

INSTITUTE OF GENERAL ORGANIC CHEMISTRY (IQOG) FROM CSIC. MADRID



Research on development of innovative analytical techniques and methodologies, mainly separation (high-resolution gas and liquid chromatography and capillary electrophoresis), for application in environmental, food and health topics.

SERVICES & FACILITIES

Development of methods for the analysis of metabolites of trace organic pollutants in environmental and human samples.

Lourdes Ramos (female). PhD in Sciences by the Autonomous University of Madrid (1997). She performed a two-year postdoctoral stay at the Department of Analytical Chemistry and Applied Spectroscopy of the Free University (Amsterdam, Netherlands). Since 2001, she has been working as Scientific Researcher in the Department of Instrumental Analysis and Environmental Chemistry of IQOG. Scientific activity devoted to the development of new miniaturized sample preparation methods for the determination of organic micropollutants in foods and complex environmental samples, as well as evaluation and development of new chromatographic techniques, with special attention to those based on GCxGC. Publication of more than 95 papers and chapters of specialized books. In the recent years she has been involved in the identification and characterization of new contaminants, specifically on the migration of silver nanoparticles that are released from commercial packaging and adhere to the foods. On October 19, 2016, The Analytical Science journal appointed her among the 50 most influential female scientist in the area of analytical chemistry.

POLITICAL & FINANCIAL SUPPORT

There are regular monthly meetings of the groups participating in the Environment and childhood network (Infancia y Medio Ambiente, INMA) (IDAEA-CSIC, IS-Global, FISABIO, Biodonostia, FINBA-Asturias, CBR). Furthermore, these groups organize a scientific meeting that is celebrated every two years. These meetings are used to report the last achievements generated from the studies of the cohorts belonging to INMA and offer a floor for presentations of the young scientists. The INMA groups work in a coordinate way for what concerns environmental exposure and child development, exchanging knowledge and data generated in each constituent cohort.

In the last six months, the Spanish Ministry of Health launched through the Instituto de Salud Carlos III a network of the Spanish Groups working in human biomonitoring. This network is participated by several research groups including IDAEA-CSIC, CNSA, FISABIO, Biodonostia, FINBA-Asturias and CBR in addition of other Spanish groups.

The coordination of these two initiatives will be useful to consolidate a Spanish node integrated inside EIRENE.

In addition, a key initiative has been the development of an [Exposome hub](#) promoted by the Severo Ochoa Programme at ISGlobal. It impeded the creation of yearly [exposome courses](#), including this year in Spanish language bringing researchers from all part of Spain and South America. The hub has also organize monthly sessions with researchers on the exposome from Spain and abroad.

The EHEN project, recently funded by the EC and led by a Spanish institution ISGlobal, will impulse the creation of an international exposome research network.

The groups participating in INMA obtain their financing by participation in Spanish and European research proposals.

In addition, there is some funding from the network of Public Health to support a manager for coordination of the members participating in the INMA cohort from the Public Health Epidemiology Biomedicine Research Center of the Institute of Health Carlos III (CIBER).

The monthly meetings of the INMA cohort are used for the coordination of the proposals based on the different cohorts belonging to this network.

INTRODUCTION

The EIRENE Sweden node has six partner universities. The node is working informally as an infrastructure, i.e. it is performing services to authorities and researchers in the chemical analytical domain. This includes some toxicological testing and of both human and environmental (wildlife and abiotic matrices) samples. The node is distributed and presently without political support from Sweden. However, EIRENE Sweden is now applying to be approved for the national roadmap. If approved, we will be able to apply for national RI funding late 2024/early 2025 that again, if approved will give funding for our national infrastructure from the start of 2026.

National Node Contact Point

- Aka Bergman
- ake.bergman@oru.se

The Swedish national node is constructed with cooperation with other infrastructures such as the National Specimen Bank and with relevant cohort for environmental exposures to chemical pollutants and chemicals of concern, such as SELMA and NorthPop.



CONSORTIUM MEMBERS

PARTNER UNIVERSITY	SHORT NAME	PI/CONTACT PERSON	EMAIL
KAROLINSKA INSTITUTET (KI-1)*	KI	Joakim Diller	joakim.dillner@ki.se
KAROLINSKA INSTITUTET (KI-2)*	KI	Craig Wheelock	craig.wheelock@ki.se
LINKÖPING UNIVERSITY	LiU	Susana Cristobal	susana.cristobal@liu.se
STOCKHOLM UNIVERSITY (SU-1)*	SU	Jonathan Martin	jonathan.martin@aces.su.se
STOCKHOLM UNIVERSITY (SU-2)*	SU	Elena Gorokhova	elena.gorokhova@aces.su.se

SWEDISH UNIVERSITY OF AGRICULTURAL SCIENCES (SLU-1)*	SLU	Karin Wiberg	Karin.Wiberg@slu.se
SWEDISH UNIVERSITY OF AGRICULTURAL SCIENCES (SLU-2)*	SLU	Ylva Sjunnesson	Ylva.Sjunnesson@slu.se
UMEÅ UNIVERSITY	UMU	Patrik Andersson	patrik.andersson@chem.umu.se
ÖREBRO UNIVERSITY (NODE LEADER)	ORU	Anna Kärrman & Åke Bergman	Anna.Karrman@oru.se ake.bergman@oru.se

Primary contribution to EIRENE Sweden. KI-1: Service #5; KI-2, SU-1, SLU-1: Services #3 and #4; SU-2 and SLU-2: Service #5

The research topics for which the infrastructures have been built are research requiring advanced mass spectrometric analyses capable of high throughput MS workflows, using multiwell liquid handling robotics, low-resolution MS for sensitive and quantitative target analysis of priority substances, high-resolution MS for semi-quantitative untargeted discovery. Further, research project requiring exposome analysis, including metabolomics, proteomics, epigenomics and adductomics. Research project are supported through integrating exposure and effects data done by cataloguing and sharing data and through cheminformatics experience and in silico methodologies.

The research carried out is both human health, wildlife, and domestic animal-related, all from the One Health perspective. Further experimental toxicological studies are performed, as well as research projects on human cohorts to understand environmental exposures to anthropogenic chemicals.

SERVICES & FACILITIES

The services are presented under the Exposome Services and Needs of Human Resources under 9 categories:

- *Collecting and providing samples (including bio, environmental, and specimen banks) to determine exogenous substances*
SU declare: Access to the Swedish national marine monitoring of biological effects of contaminants (animals and sediment); 35 stations/samples a year, categorized as contaminated and reference sites.
 National Facility for Exposomics offers services of passive air sampling on PDMS-foam disks, which are simple, inexpensive and easily deployable indoors and in the field with various sample housings.

- *Access to human health and/or exposure data on an individual level*
Nothing declared from the Swedish node.
- *Measurements of exogenous substances including target and nontargeted measurements of chemical mixtures (or other pollutants) as well as parent and transformation exposure markers in humans and the environment*
ORU declare: SFC, LC or GC-mass spectrometry analysis. Services are offered for mass spectrometry quantification of micropollutants and suspect screening. Human, biota and abiotic samples.
SU declare: SU/ACES direct the National Facility for Exposomics, SciLifeLab, which has expertise in small molecule untargeted mass spectrometry in human and environmental samples. We offer combined target (180 analytes) and nontarget coverage (typically >10,000 features with MS2 spectra) of the chemical exposome in biofluids, tissues, and water samples. Comprehensive trace analysis by liquid (LC) or gas chromatography (GC) with Orbitrap mass spectrometers operating in full scan with parallel data-independent (DIA) MS2 (for LC workflows). Special methods are offered for enhanced exposomics of human plasma by phospholipid depletion, and for environmental water by in-line solid phase extraction. High throughput structural annotation of unknown small molecules using molecular networking, in silico fragmentation and PubChemLite. All data processing uses open science software and FAIR data management. Exposure markers, including exposome-metabolome interactions are elucidated by multivariate data analysis and modelling.
SLU declare: LC and GC-mass spectrometry analysis. Services are offered for mass spectrometry quantification of micropollutants, suspect and non-target screening. Biota and abiotic samples.
KI declare: SFC- and LC -mass spectrometry analysis. Services are offered for mass spectrometry quantification of exogenous compounds including pollutants and drugs. Services performed in any biological matrix.
- *Omics-based analysis of markers of biological response (separate: metabolomics, lipidomics, adductomics, (epi)genomics, metagenomics/microbiomics, transcriptomics, proteomics, phenomics)*
ORU declare: Metabolomics/exposomics platform (biological matrices) and Lipidomics platform (biological matrices).
SU declare: Microbiome markers in sentinel species used in environmental monitoring and DNA adductomics (biological matrices).
KI declare: Metabolomics/exposomics platform (biological matrices) and Lipidomics platform (biological matrices).
LiU declare: Proteomics platform.
- *Quantification/determination of toxicity (human- and ecological), pathways and modes of action (in-vivo, ex-vivo, in-vitro, in-silico)*
ORU declare: In-vivo models for aquatic and terrestrial systems.
SU declare: In vivo models for aquatic ecotoxicology.

SLU declare: In vivo and in vitro models for aquatic and mammalian oocyte maturation and early embryo development. For zebrafish and mollusc also the possibility to follow generations. Also, EDA platform including i) in vitro effect-based toxicity testing for key molecular initiating events in important toxicity pathways, ii) fractionation of active samples to reduce chemical complexity and iii) advanced chemical analysis (suspect screening, non-target screening).
KI declare: Human Exposome Assessment Platform (HEAP); Metagenomics and Software (web and mobile platforms) for data collection from population-based studies.

LiU declare: Quantification/determination of impact of exposure for human health, pathways impaired, and prediction of mechanism of action of chemicals (in vitro and in-chemico).

UMU declare: In silico competence available and platforms existing at UMU tailored for mainly Life Science applications and service (eg via CLIC platform).

- *Biostatistical and/or bioinformatics tools and platforms to investigate the exposome and human health interactions*

ORU declare: Advanced bioinformatics tools data analysis, multi-omics data integration, and MS data association to health outcomes. Harmonization of MS-based targeted- and non-targeted data across cohorts/platforms using in-house methods (R, Phyton). Data analysis include knowledge-based integration of health endpoints with omics (whole-genome sequencing, metagenomics, proteomics, metabolomics and exposomics).

SLU declare: Advanced bioinformatics tools based on in-house or NORMAN Network methods. Evaluation of environmental and human health interactions.

LiU declare: Advanced bioinformatics tools data analysis, omics data integration, and MS data association to health outcomes. Our facility covers annual software license renewals fees for many analytical programs. Development of new data analysis pipelines is also feasible.

- *Databases and exposure maps on environmental factors (e.g. pollutants, temperature, noise, socio-economic, life style)*

SU declare: Data integration for environmental status assessment in the Baltic Sea to support decision makers and HELCOM in guiding pollution management and ecosystem resources. iBEC (indicator-based platform) for regional applications of biological effects in different subbasins.

SLU declare: SLU environmental data base (<https://miljodata.slu.se/mvm/>) for the aquatic environment including agricultural land.

- *FAIR cataloging of exposome data (e.g. cohorts, algorithms)*

SU declare: For biological effect data, including DNA adductome, we provide data/metadata submission workflow (for submission to e.g., ICES/HELCOM data service) in FAIR way, based on the recent developments in projects, such as Interreg-BEACON, PARC, and D2P-Biodiversa+.

LiU declare: Proteomics data will range from raw files produced by machines (e.g.

by MS) to structured and standardized formats (e.g. mzXML for MS data). Findability of data/research outputs; Accessibility of data/research outputs and Interoperability of data/research outputs.

- *Training*

ORU declare: Hands-on training in exposomics and lipidomics analysis, from sample extraction (different biological matrices) and mass-spectrometry-based analysis to biological interpretation. MSc and Ph.D. level. Also: Course in instrumental analytical methods, focusing mainly on spectroscopy methods and LC and GC analysis coupled to MS, including a module of mass spectra interpretation. BSc students.

SU declare: Hands-on training in ecotoxicity microbiome assays and biomarker analysis. MSc and Ph.D. level and Hands-on training in adductomics analysis workflow, sample preparation, LC-MS analysis and data processing.

SLU declare: Hands-on training in bovine, porcine, feline, zebrafish and Lymnea in vitro embryo production and assays related to development and quality (mammalian cumulus expansion, cleavage, embryo development and quality, fluorescent staining for confocal or fluorescence microscopy of all stages, collection of all stages for RNA-expression analysis or epigenetic analysis), for zebrafish and lymnae also in vivo assays available across generations. PhD course in Organic Micropollutants in the Aquatic Environment: Measurements and Transport from Source to Tap (OmAqua, 5 hp), focusing mainly on sampling, sample preparation and target MS analysis.

Possibility for training of guest reserachers, master students and interns. *LiU declare:* Hands-on training in proteomics pipelines, from sample extraction (different biological matrices) and mass-spectrometry-based analysis to biological interpretation. MSc and Ph.D. level.

POLITICAL & FINANCIAL SUPPORT

The Swedish Research Council has called for a national Needs Inventory with deadline Nov. 7, 2023. EIRENE Sweden is “applying” to be approved for the Swedish roadmap for research infrastructures.

Since EIRENE Sweden is not yet a national infrastructure the present work is based on project funding that may be interpreted as “user fees”

STAKEHOLDERS

Swedish authorities with responsibilities for health and environment, particularly emerging risks to chemical pollution, that includes nine national authorities called SamTox. NGOs and business also contribute with project requests. The external are primarily from research projects, presently the partnership program PARK but may as well be smaller projects at the individual universities in the county or outside Sweden.



UNITED KINGDOM

National Node Contact Point

- Martin Bobak
- m.bobak@ucl.ac.uk



UNITED STATES

INTRODUCTION

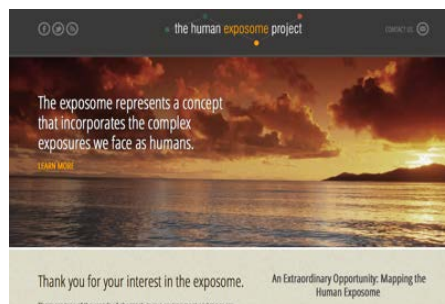
Exposome USA is a research collaborative based at Columbia University and overseen by the Center for Innovative Exposomics. We are developing a wide range of methods to improve the field of exposomics including mass spectrometry, geospatial sciences, and data sciences.

The U.S. Hub of EIRENE is based at Columbia University.

We are still exploring how to expand our node to officially include other institutions, but we are currently collaborating with teams at Brown University, Emory University, Johns Hopkins University, Harvard University, Yale University, and the Mayo Clinic. Unlike the European institutions, we are unable to be the official representative of the U.S., but rather, we represent a large contingent of exposome investigators in the country. The team holds regular meetings focused on technology development and harmonization and collaborates on multiple grant projects.

National Node Contact Point

- Gary Miller
- gm2815@cumc.columbia.edu



COUNTRY PROFILES - NEW MEMBERS



CYPRUS

INTRODUCTION

The EIRENE Cyprus node has three partner universities/institutes. The Cyprus node is currently working informally as a children health cohort infrastructure, i.e., the Cyprus CHILDREN_FIRST. CHILDREN_FIRST is a pioneering infrastructure type of a children cohort that will concentrate its resources and activities on the longitudinal assessment of key environmental (non-genetic) risk factors in association with the temporal evolution of respiratory, cardiometabolic or neurodevelopmental outcomes in primary school aged children's populations in six cohort sites from five Mediterranean countries: Cyprus, Greece, Spain, Albania and Israel. The CHILDREN_FIRST country cohort site is an infrastructure led by the Cyprus University of Technology (CUT) and it was launched back in early 2022. The cohort infrastructure is based on a harmonized, and predefined set of cohort tools, methodologies and applications to provide a uniform and high-quality assessment of children's environment and health. This is a EU-unique cohort research infrastructure that will serve as a pivotal platform for doctoral students to conduct high-quality research in the realm of personalized prevention schemes for children's health, leveraging the concept of the human exposome and its exposomic tools. The overall theme of this doctoral network is based upon the personalized prevention approach and the exposome concept in children's health. Personalized medicine or personalized prevention studies differences in children's genes, environments and lifestyles, hence, they can provide knowledge about enhanced risk profiling and population stratification, but also about how such information can be used to improve children's health. To our best knowledge, CHILDREN_FIRST represents the first comprehensive personalized prevention program for primary school aged children in the Mediterranean region, using exposome methodologies and tools to discover important biomarkers of exposure/effect and better predict and prevent disease at this susceptible critical lifetime window.

National Node Contact Point

- [Konstantinos Makris](#)
- konstantinos.makris@cut.ac.cy



RESEARCH FOCUS

Major planetary health stressors, such as climate change, global pollution and biodiversity loss impact adversely on human health in Cyprus, and these will happen more frequently, with greater duration and intensity in the future. As such, Cyprus must be prepared to tackle such environmental and planetary risks to human health in a serious and well organized fashion and approach. Integrating the often fragmented research from genetics or the environmental health sciences into a commonly understood and harmonized landscape of a RI is a difficult and complex task. Only with the harmonisation and integration of tools, methodologies and applications that capture both the environmental exposures (exposome) and the genome could bring us closer to disease phenotype

in Cyprus and allow us to design personalized prevention schemes for preventing and predicting disease for different risk groups in Cyprus. Such an RI in Cyprus does not exist. This Cyprus RI node would bring together research teams and institutions that work either in the environmental and public health or in the genetics field to combine and synthesize such work into the personalized prevention arena as part of the personalized medicine initiative of Europe.

CONSORTIUM MEMBERS

Cyprus University of Technology



Profs Makris and Christophi, and Dr. Kyriakou from Cyprus International Institute for Environmental and Public Health (CII) specializing in non-communicable disease epidemiology and exposome applications in population studies / Prof. Hadjimitsis from the Dept of Civil Engineering and Geomatics, specializing in satellite-based data observations and geospatial analyses / Prof. Theodorou specializing in speech therapy and neurodevelopment of children.

UNIVERSITY OF CYPRUS



Prof. Deltas, Medical School, Center of Excellence in Biobanking and Biomedical Research, and Prof. Agapiou from Dept. of Chemistry

THE RESEARCH INSTITUTE OF CHILD HEALTH IN NICOSIA

Dr. M. Tornaritis, PI and Director of the Institute and Dr. H. Hadjigeorgiou, Paediatrician) have led the Cyprus cohort site in the IDEFICS/Ifamily EU cohort network in children from eight EU countries, including Cyprus.

SERVICES & FACILITIES

The services are presented under the Exposome Services and Needs of Human Resources:

1. *Collecting, biobanking and providing samples and access to human health and/or exposure data on an individual level*

Access to the Cyprus biobank led by Prof. Deltas. Access to CHILDREN_FIRST and to CUT biobanked biospecimen from earlier Cyprus population studies with over 15000 biological specimen from about 10000 volunteers.

2. *Measurements of target and nontargeted measurements of chemical mixtures (or other pollutants) in humans and the environment*

The research topics for which the infrastructures have been built are research requiring advanced mass spectrometric analyses capable of high throughput MS workflows, low-

resolution MS for sensitive and quantitative target analysis of priority substances, and for semi-quantitative untargeted discovery, including metabolomics and volatilomics.

3. *Biostatistical and/or bioinformatics tools and data processing platforms to investigate the human exposome*

Harmonization of MS-based targeted- and non-targeted data across cohorts/platforms using in-house methods (R). Data analysis include knowledge-based integration of health endpoints with omics (*whole-genome sequencing, metagenomics, proteomics, metabolomics and exposomics*). *Satellite databases and geo-exposure maps on environmental factors are available for exposome mapping.*

4. *Training*

- Employ a combination of machine learning and deep learning algorithms, geostatistics, spatial regression models and related methodologies, and earth observation (remote sensing and geographical information science) for examining the spatial dimensions of external exposomic factors across childhood, including low-cost sensors, satellite data and secondary data on air pollution and meteorology from governments in each of the five sites.
- Metabolomic profiling of children's urine samples, 2. Volatile organic chemical (VOC) assessment in children saliva across childhood, 3. Spatiotemporal integration of metabolite data with salivary VOCs and anthropometric/lifestyle/behavioral patterns in all sites

POLITICAL & FINANCIAL SUPPORT

EIRENE Cyprus is not yet a national RI, so it is self-funded currently. Contacts with the relevant Ministry have been made to consider cyprus inclusion into the RI.

STAKEHOLDERS

Cyprus governmental authorities such as the Ministry of Health, the Ministry of Education, the Ministry of Environment and the State General Lab. Also, the private sector of biomedicine, biotechnology and diet, or pharma is considered. NGOs and business also contribute with project requests. The external are primarily from research projects.



DENMARK

National Node Contact Point

- Torben Sigsgaard
- ts@ph.au.dk



LUXEMBOURG

National Node Contact Point

- Radu Duca
- radu.duca@lns.etat.lu



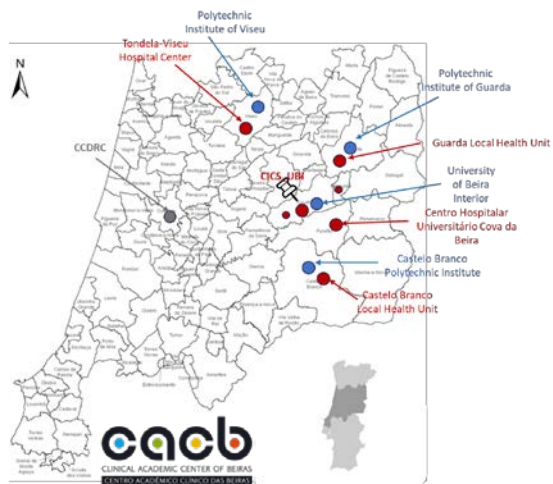
PORTUGAL

INTRODUCTION

A consortium between a health sciences research center, health colleges, hospitals and health units, spread across a region severely affected by forest fires. This partnership allows the access to human samples and data from a broad region.

National Node Contact Point

- Graza Baltazar
- gbaltazar@fcsaude.ubi.pt



AUSTRIA

DigiOmics4Austria (2023-2026)

A 3-year project associated with the Federal Ministry of Science´s (BMBWF) initiative of digitalization at universities; through this funding, EA aims to cover: digital agendas, lab management systems, mass spec library of toxic chemicals, servicing of instruments, research data management

Exposome Austria - Preparatory and Industrial Module (2023-2029)

A 6-year project of the Federal Ministry of Climate (BMK) supporting EA to pursue goals such as: establishing ´Open Access´ for Austrian researchers, fostering the interface between science and industry to intensify exchange and know-how transfer, strengthening technical, administrative, and organizational resources

The national EIRENE node in Austria is continuously supporting research projects (ERC, FWF etc.) by offering analytical services that are already in place at UNIVIE. Currently, four projects that received EA support/offer letters are under review.

BELGIUM

FLEHS-5

5th exposome-oriented cycle of the Flemish Human Biomonitoring program (2023-2027)

PFAS Environmental study

Monitoring of PFAS content of environmental and food samples around PFAS factory in Flanders

PARC

Partnership for the Assessment of Risks of Chemicals (2022-2028). Exposure & health risks of (mixtures of) chemicals and mycotoxins, including exposure-health effect associations, identification of exposure and effect biomarkers and pathway analysis.

GLORIA

Ghent Longitudinal Observational Research Investigating aging (2022-2042). Large-scale Flemish prospective cohort study (N=20,000) - interplay of genome & exposome - age-related health outcomes

Human Sentinel Studies

KU Leuven. Collecting representative data on occupational exposure by using a sentinel surveillance method involving occupational physicians as a sentinel network and employees who answered a web-based survey on exposure to 22 chemicals.

INQUIRE

Horizon Europe (2022 – 2025). Improving indoor air quality for a healthier home and Europe (UAntwerp, VITO).

FLEXiGUT - iBOF Exposome project

(2021 – 2025). Flemish project on the impact of dietary and environmental exposure on chronic low-grade gut inflammation (KULeuven, UGhent, UAntwerp)

FRANCE

SCREENPEST (2021-)	Development and implementation of a new large-scale screening approach for extended characterization of human exposure to pesticides, Co-PI (PI : L. Debrauwer), Ecophyto2+, 0,4 M€
BETA (2020-)	PFAS Human exposure and transgenerational effects (PI F. Mancini), ANSES, 0,1 M€
ENDOXOMICS (2021-)	Linking environmental chemical biomarkers and endometriosis: a proof-of-principle MWAS (PI G. Cano-Sancho), FRM, 0,3 M€
EGLANTINE (2021-)	Characterization of the chemical exposome in the elderly general population and its relation to brain health., Co-PI (PI : C. Samieri), FRM, 0,7 M€
GAMMA (2021-)	BFR/OCs/PFAS Human exposure and transgenerational effects (PI F. Mancini), Fondation de France, 0,1 M€
2022-2025	Influence of the chemical, nutritional and social exposome on breast cancer risk (PI : V. Bessonneau), CGO, 0,15M€
2023-2024 - GHANA	OCs Human exposure and prostate cancer (PI L. Hurwith), NIH/NCI, 0,1 M€
2023-2025 CHEMVAX	PFAS exposure and COvid-19 vaccination response (PI: Robert Barouki/Sylvia Sanquer), ANSES, 40 k€.
2024-2026 POPENDO	POPs exposure and endometriosis (PI: Marina Kvaskoff), ANR 200 k€
2024-2026 CHLOECAPA	OCs exposure and prostate cancer (PI : Gaëlle Fromont), INCa, 0,55 M€
2024-2027	Pilot study to evaluate the feasibility to map the human exposome from existing EU health studies and explore the links with pediatric cancers risk (PI: V. Bessonneau), EU JA-PreventNCD, 0,25 M€

SLOVENIA

Jožef Stefan Institute, Department of Environmental Sciences

National Projects:

- P1-0143, Substance Circulation in the Environment, Material Balance, and Modeling of Environmental Processes, and Risk Assessment, 2021-2025
- J1-3033, Innovative Isotopic Techniques for Identifying Sources and Biogeochemical Cycling of Mercury in Contaminated Areas - IsoCont, 10/01/2021 - 09/30/2024
- V3-2236, Assessment of the Potential Impact of Waste Incineration and Co-Incineration on Human Health Effects: A Model Study at the Salonit Anhovo Cement Plant, 2022-2024, Milena Horvat
- J7-9400-1, Neuropsychological Dysfunctions Caused by Low-Level Exposure to Selected Environmental Pollutants in a Sensitive Population – NEURODYS, 07/01/2018 - 06/30/2021, Milena Horvat
- N1-0100, BE MERMAiD - Methylation of Bioavailable Mercury in the Adriatic Sea, 01/01/2019 - 12/31/2022, Milena Horvat
- J1-9194 - Nanomedicines with Antibiotics and Probiotics for Local Treatment of Periodontal Disease, 1st July 2018 - 30th June 2021, Julijana Kristl (FFA), Aleš Lapanje (IJS)
- J3-2530 - Effect of Endocrine Disruptors (Bisphenols, Parabens, Triclosan) and Potentially Toxic and Essential Chemical Elements on Childbirth, Infertility, and Ovarian Cancer in Slovenia, 1st September 2020 - 31st August 2023, Irma Virant Klun (UKC), Milena Horvat (IJS)
- J4-2546 - Monitoring the Clinical and Immune Response to Improve the Outcome of Combined Electrochemotherapy and IL-12 Gene Therapy in Dogs with Spontaneous Peripheral Tumors, 1st September 2020 - 31st August 2023, Nataša Tozon (VF UNI-LJ), Tina Kosjek (IJS)
- J4-2550, Identifying the Genetic Determinants of Chemical Toxicity in the Green Alga *Chlamydomonas reinhardtii*, 1st September 2020 - 31st August 2023, Anže Županič (NIB), Milena Horvat (IJS)
- J7-4635 - MitoCan - Preclinical Development of New Mitochondrial Ion Channel Inhibitors for Cancer Therapy, 1st October 2022 - 30th September 2025, Lucija Peterlin Mašič (FFA UL), Tina Kosjek (IJS)

Selected international projects:

- HE – PARC, The European Partnership for the Assessment of Risks from Chemicals, 1st May 2022 - 30th April 2029, Milena Horvat
- HBM4EU - European Human Biomonitoring Initiative, 1st January 2017 - 30th June 2022, Milena Horvat
- URBANOME, Health, Well-being, and Suitability for Living in Cities, March 2021 - February 2025, Milena Horvat
- NEUROSOME, Exploring the Neurological Exposome, 1st October 2017 - 30th September 2022, Milena Horvat
- OE - EIRENE PPP; Preparatory Phase Project for the Assessment of Environmental Exposure of Research Infrastructure, 2022 - 2025, Milena Horvat
- GREENER, Integrated Systems for Effective Environmental Remediation, 1st March 2019 - 31st August 2023, Aleš Lapanje

- THEROS, An Integrated Toolbox for Improved Verification and Prevention of Adulterations and Non-compliances in Organic and Geographical Indications Food Supply Chain, 1st January 2023 - 31st December 2025, David Kocman
- H2020 - GMOS-Train; Global Mercury Observing System and Interdisciplinary Training to Support the Minamata Convention, 2020 - 2024, Milena Horvat
- H2020 - MERFISH; Studying Interactions of Hg and Se in Fish and Their Impact on Human Health, 2021 - 2025, Milena Horvat
- SurfBio, Innovation Hub for Surface and Colloid Biology Research, 1st December 2020 - 30th November 2023, Aleš Lapanje
- TransCPearlywarning, Establishment of Transnational Civil Protection EARLY WARNING System to Improve the Resilience of Adriatic Territories to Natural and Man-made Risks, 1st March 2020 - 28th February 2023
- Food-MetNet, Support for a European Metrology Network on Food Safety, 1st June 2021 - 31st May 2024, Nives Ogrinc
- eMPIR EDC-WFD, Metrology for Monitoring Endocrine Disrupting Compounds under the Water Framework Directive, 1st September 2019 - 2023, Ester Heath
- HE – FishEUTrust, European Integration of New Technologies and Social-economic Solutions for Increasing Consumer Trust and Engagement in Seafood Products. 1st June 2022 - 31st May 2026, Nives Ogrinc
- HE – BIOSYSMO, Bio-remediation Systems Exploiting Synergies for Improved Removal of Mixed Pollutants, 1st September 2022 - 31st August 2026, Aleš Lapanje
- HE – INQUIRE, Identification of Chemical and Biological Determinants, Their Sources, and Strategies to Promote Healthier Homes in Europe, 2022 - 2027, David Kocman & Janja Snoj Tratnik
- HEALS - 7. OP The Relationship Between the Environment and Health in Large Population Investigations (Partner)
- NEUROSOME – H2020 MSCA ITN Exploring the Neurological Exposome (Partner)
- ICARUS - H2020 -; Integrated Approaches for Reducing Air Pollution in Urban Environments with Effects on Climate Change
- CitieS-Health - H2020 Civic Science for Urban Environment and Health (Partner)

National Institute of Biology, Department of Genetic Toxicology and Cancer Biology

Ongoing EU and national projects:

- TWINNING FOR EXCELLENCE TO STRATEGICALLY ADVANCE RESEARCH IN CARCINOGENESIS AND CANCER (CutCancer); Coordinator of the project: assoc.prof. Bojana Žegura, HORIZON-WIDERA-2021-ACCESS-03101079113; 2023-2025
- European Partnership for the Assessment of Risks from Chemicals (PARC) Principle Investigator for Slovenia: assoc.prof. Bojana Žegura HORIZON-HLTH-2021-ENVHLTH-03;101057014; 2022-2029
- Nanomaterials for Enzymatic Control of Oxidative Stress Toxicity and Free Radical Generation (NESTOR) Principle Investigator for Slovenia: assoc.prof. Bojana Žegura NESTOR-H2020-MSCA-RISE-2020;101007629; 2021-2025
- EVIDENCE DRIVEN INDOOR AIR QUALITY IMPROVEMENT (EDIAQI), Principle Investigator for Slovenia: assoc.prof. Bojana Žegura HORIZON-HLTH-2021-ENVHLTH-02;101057497; 2022-2026

National ARIS programme and projects (lead partners)

- P1-0245. Ecotoxicology, toxicogenomics and carcinogenesis, 1999-2024, Programme leader: assoc.prof. Bojana Žegura,
- J1-4395 - Development of novel multifunctional metal-oxide-based nanozymes and their toxicological characterisation (NaNoZymSafe), 2022-2024, assoc.prof. Bojana Žegura
 - J1-4395 - Advanced 3D cell models: Bridging the gap between in vitro and in vivo experimental systems (hep3DGenTox), 2022-2024, Assoc. Prof. Bojana Žegura
 - L3-3177 - Safety evaluation of cannabidiols and implications for public health and consumers behaviour, 2022-2024, Project leader: Assist. Prof. Alja Štern
 - Z1-31915 - Bisphenol A and its analogues: Are BPA analogues hazardous for human health? (BPAnalogues), 2021-2023, Project leader: Dr. Marina Štampar

- J3-501096 - Identification of gamma delta T cell fitness determinants for cancer immunotherapy by their immunoprofiling in patients with immune-mediated diseases, 2023-2026, Principal Investigator: Dr. Anže Smole
- J3-30847 - Inducible Programming of CAR T Cell Intrinsic Properties for Cancer Immunotherapy, 2021-2024, Dr. Anže Smole
- MN-0013-105 - TREXcell Story of regulatory T cells told through their transcriptome
Principal Investigator: Dr. Jelka Pohar, 2023-2026
- J3-4504 - Uncovering the glioblastoma microenvironment to enhance the therapy, 2022-2025, Project coordinator: Dr. Metka Novak
- ARIS project
- J2-442810 - Green solutions for sustainable multi-use management of waters, 2022-2024
- J7-4635 - Discovery of new benzamide-based KV1.3 and mitochondrial KV1.3 inhibitors (MitoCan), 2022-2024, Assoc. Prof. Bojana Žegura
- J7-4635 - Dynamical model of a type II DNA topoisomerase biological nanomachine and design of catalytic inhibitors, 2021-2023, Assoc. Prof. Bojana Žegura
- ARIS project
- J1-30193 - Computational and experimental investigation of senescent cells modulation as a new tool to combat age-related diseases, 2022-2024, Assoc. Prof. Bojana Žegura
- J1-2471 - Chemical Carcinogenesis: Mechanistic Insights, 2022-2024, Assoc. Prof. Bojana Žegura
- ARIS project
- J2-500475 - Plasma-assisted removal of emerging genotoxic contaminants from wastewater, 2023-2025, Assoc. Prof. Bojana Žegura
- J4-50147 - Exploring the theranostic potential of aegerolysin-based protein complexes in combating urothelial cancer, 2023-2025, Assoc. Prof. Bojana Žegura
- J3-45167 - Neoantigens in non small cell lung cancer, 2022-2025, Dr. Anže Smole, Dr. Jelka Pohar

- L4-31818 - Hierarchical DNA assembly for advanced applications in biopharmaceuticals production and cell therapy, 2021-2024, Dr. Jelka Pohar, Dr. Anže Smole
- NC-0023 - Bilateral project Slovenia-France (CEA): Innovative Probes and Inhibition of Metalloproteases for Targeting Glioblastoma Stem Cells in Tumour Microenvironment, 2022-2024, dr. Barbara Breznik
- BI-US/22-24-007 - Bilateral scientific cooperation project SLO – USA: The Role of MAGE Proteins in Glioblastoma Stem Cells and Therapy Resistance: Can Stem Cell Biology Help Better Treat Therapy-Resistant Brain Cancer?, 2022-2024, Barbara Breznik, PhD

University of Ljubljana, Faculty of Medicine, Department of Public Health (UL FM, DPH)

National projects

- P3-0429 - Programme: Slovenian Research Program for a Comprehensive Approach to Cancer 2022 – 2027, Project Leader or Coordinator: Prof. Dr. Vesna Zadnik
- V3-2236 - Assessment of the Potential Impact of Waste Incineration on Human Health: A Case Study of the Salonit Anhovo Cement Plant, 2022 – 2024, Assoc. Prof. Dr. Andreja Kuvec
- V3-2317 - Assessment of the Relationship Between Asthma Prevalence and Environmental Risk Factors in Children and Adolescents: A Model for Evidence-Based Interventions 2023 – 2025, Assoc. Prof. Dr. Andreja Kuvec
- V3-1904 - Development of a Model for Predicting Indoor Air Pollutant Exposure in Schools and the Preparation of Evidence-Based Measures for Efficient Classroom Natural Ventilation Planning, 2019 – 2022, Assoc. Prof. Dr. Andreja Kuvec
- V3-1722 - Interpretation of Biomonitoring Results in Relation to Environmental Pollution, with an Emphasis on Air Pollution and the Assessment of Potential Health Effects on the Population, 2018 – 2019, Prof. Dr. Milena Horvat
- V3-1640 - Exposure of Children and Adolescents to Selected Chemicals through the Living Environment, V3-1640 2016 – 2019, Prof. Dr. Milena Horvat

International projects

- COST Action IS1408 - Network for Industrially Degraded Areas and Health, 2015 – 2019: Assoc. Prof. Dr. Andreja Kuvec / National Coordinator and Principal Investigator
- InnoRenew • Project Type: H2020 WIDESPREAD-2-Teaming; #739574 • Project Duration: 2017 – 2023 Role in the Project: Assoc. Prof. Dr. Andreja Kuvec / Researcher
- Interreg CENTRAL EUROPE - International Measures for Integrated Indoor Air Quality Management, • Project Duration: 2016 – 2019, Role in the Project: Assoc. Prof. Dr. Andreja Kuvec / National Coordinator and Principal Investigator
- LIFE12 ENV/IT/000834 - Long-Term Exposure to Polluted Air and its Health Consequences, 2013 – 2016, Role in the Project: Assoc. Prof. Dr. Andreja Kuvec / National Coordinator and Principal Investigator
- HE – PARC, The European Partnership for the Assessment of Risks from Chemicals, 1st May 2022 - 30th April 2029, TLP to JSI

University of Ljubljana, Faculty of Pharmacy

National programmes and projects:

- P3-0298: Genes, hormones and personality changes in metabolic disorders, 01.01.2019 - 31.12.2024, Andrej Janež, Janja Marc
- J1-4402 Dynamical model of a type II DNA topoisomerase biological nanomachine and design of catalytic inhibitors 1.10.2022 - 30.9.2025; Andrej Perdih, Marija Sollner Dolenc
- J3-4527 Muscle cell secretom and bone cells interplay in osteosarcopenia (MiKOSA), 1.10.2022 - 30.9.2025, Janja Marc

Current international projects:

- Interreg IT/SLO: Ecosystem for Advanced Regenerative Medicine Therapies
- CELSA: Generation of nanobodies against immunomodulating checkpoint receptors in glioblastoma tumor cells
- boDEREC – CE – Board for Detection and Assessment of Pharmaceutical Drug Residues in Drinking Water – Capacity Building for Water Management in CE
- Erasmus+ OEMONOM
- Extraction and enrichment of whey proteins and the use of the residuals for the design of new functional foods and dietary supplements
- PhD4GlycoDrug
- EATRIS-TRI.si: Development of the research infrastructure for international competitiveness of Slovenian RRI space – RI-SI-EATRIS-TRI.si
- EATRIS-Plus
- Erasmus+ ADVANCE
- Network of Research Infrastructure Centres of the University of Ljubljana (MRIC-UL): EATRIS-TRI.si
- HE – PARC, The European Partnership for the Assessment of Risks from Chemicals, 1st May 2022 - 30th April 2029, TLP to JSI

University of Maribor, Faculty of Medicine, Clinical Centre Maribor Clinic for Gynecology and Perinatology

Projects:

- P3-0427 Systemic Approaches to Human Genome Research for Personalized Medicine in Chronic Immune Diseases 2023 Dr. Uroš Potočnik
- J3-4523 Individualization of Endometrial Cancer Treatment 2022 - 2023 Dr. Jure Knez
- J3-3069 Impact of Various Surgical Techniques on the Molecular Mechanisms of Gynecological Cancer Dissemination 2021 - 2023 Dr. Iztok Takač
- J3-9272 Identification of Molecular Biomarkers for Predicting the Clinical Course and Dissemination in Triple-Negative Breast Cancer Patients 2018 - 2022 Dr. Darja Arko

- L2-3175 Advanced Extraction and Formulation of Functional Tannin-Based Dietary Supplements with Beneficial Health Effects 2021 - 2023 Dr. Željko Knez
- J3-3069 Influence of Various Surgical Techniques on the Molecular Mechanisms of Gynecological Cancer Dissemination 2021 - 2023 Dr. Iztok Takač
- J3-7177 Experimental and Laboratory Aspects of Premature Ovarian Function Failure 2016 - 2018 Dr. Veljko Vlajsavljević

International project:

- HE – PARC, The European Partnership for the Assessment of Risks from Chemicals, 1st May 2022 - 30th April 2029, TLP to JSI

Chemical Institute, Theoretical Section, Laboratory for Chemical Informatics

Ongoing national and international projects:

- Program P01-0017: Modeling of Chemical Processes and Compound Properties. Leader: Marjana Novič
- Project J4-3092: Development of Biologically Active and Chemically Stable Xanthophylls Based on Sustainable Xanthophyll Extraction from Renewable Natural Sources. 2021 - 2023. Dr. Alen Albreht (collaborator: Dr. Marjan Vračko)
- HE – PARC, The European Partnership for the Assessment of Risks from Chemicals, 1st May 2022 - 30th April 2029, TLP to JSI

SPAIN

Exposición pre y postnatal a metales y su relación con el desarrollo antropométrico y riesgo cardiometabólico durante la infancia hasta la adolescencia. Cohort: Valencia. PI: Sabrina Llop (FISABIO). 2024-2026. Code: PI23/01578

Exposición prenatal a disruptores endocrinos y su efecto en la calidad seminal y reserva ovárica (EXPRESO) Proyecto INMA. Cohort: Gipuzkoa. PI: Alba Jimeno/Jesus Ibarluzea (BIODONOSTIA). 2024-2026. Code: PI23/01524

Exposición humana a mezclas de compuestos químicos ambientales: Predicción y mitigación de efectos en salud usando nuevos biomarcadores moleculares y radiológicos. Cohort: Granada. PI: Vicente Mustieles/Mariana F. Fernandez (CBR). 2024-2026. Code: PI23/01884

Factores asociados a la transmisión de la dieta mediterránea de madres a hijos durante la infancia y su asociación con niveles de contaminantes ambientales en orina y marcadores de riesgo cardiometabólico. Cohort: Valencia. PI: Sandra Gonzalez-Palacios/Jesús Vioque (FISABIO). 2024-2026. Code: PI23/01568

Understanding how endocrine disruptors and chemical mixtures of concern target the immune system to trigger or perpetuate disease (ENDOMIX). Cohort: Sabadell. PI: Mireia Gascon (IS Global). 2023-2027. Code: 101136566

LINKS

ⁱ THL laboratory analysis services: <https://thl.fi/fi/palvelut-ja-asiointi/analyysi-ja-tutkimuspalvelut>

ⁱⁱ THL services catalog: <https://aineistokatalogi.fi/catalog>

ⁱⁱⁱ FIOH laboratory for testing and assessment of risk and safety at work environments:

<https://www.ttl.fi/en/services>

^{iv} Finnish Food Authority has laboratory services and reference laboratories:

<https://www.ruokavirasto.fi/en/>

^v Finland national roadmap for research infrastructures: <https://www.aka.fi/globalassets/1-tutkimusrahoitus/4-ohjelmat-ja-muut-rahoitusmuodot/4-tutkimusinfrastruktuurit/roadmap-for-finnish-research-infrastructures-20212024.pdf>

^{vi} Finnish Research Infrastructure for Population-Based Surveys (FIRI-PBS): <https://thl.fi/en/web/thlfi-en/research-and-development/research-and-projects/firi-pbs->
