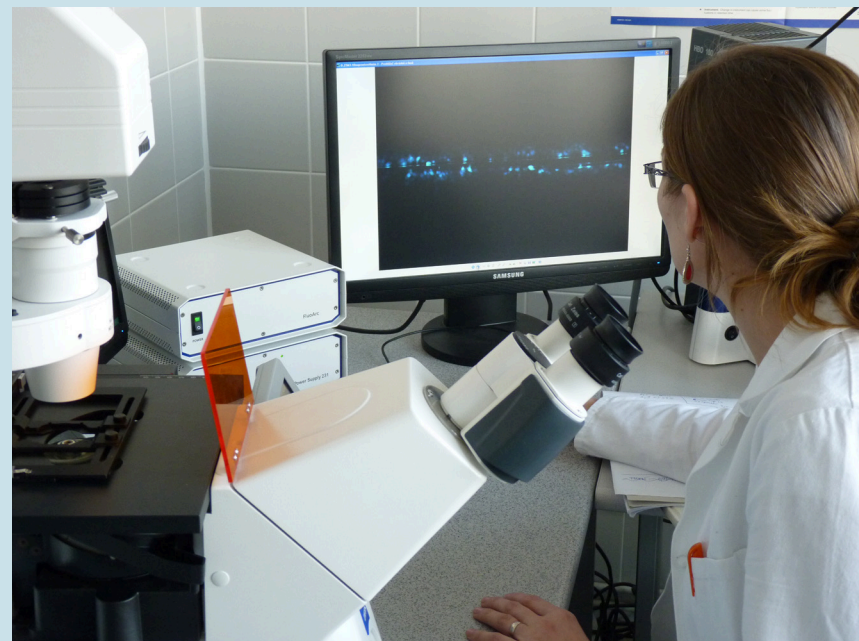


## Trace Analyses Laboratories at RECETOX



Use the Accredited Laboratories (EN ISO/IEC 17025:2005) and their expert team and infrastructure for the following services:

- Speciation analyses of toxic and essential elements in the environment (soil, sediments, water and air) and biota
- QA/QC system, validated analytical methods, professional team, Modern equipment for extractions, fractionations and purification of samples
- State of the art instrumentation for analyses of endocrine disrupting chemicals, persistent organic pollutants, dioxins, furans, brominated flame retardants, steroids, explosives, and heavy metals
- High quality results with very low detection limits
- Long-term monitoring - air, precipitation, soil, water, sediments, needles, mosses and lichens

- Air monitoring networks - MONET in Europe, Africa and Asia

- Sampling by active and passive sampler. Sampling of precipitation and surface waters, sediments, soils and biotic materials

- Capacity building - made-to-measure training for researchers and laboratory experts on various instrumentation and in development of new analytical methods

### Contact Head of TAL

**Dr. Petra Příbylová (pribylova@recetox.muni.cz), for more information.**



## Events in the Pipeline

Third phase of monitoring of persistent organic pollutants under the Stockholm Convention including preparation of the third regional monitoring reports (due 2020) and updates of Global Monitoring Plan guidance document will be discussed by a global meeting for 30 members of the Regional Organization Groups a three day meeting held in Brno 30 May - 1 June 2018. The meeting will also cover data management and visualizations by using the global online tool developed by RECETOX for UN Environment available at [www.pops-gmp.org](http://www.pops-gmp.org)

Armenian expert will build capacity in risk assessment and using GIS for presenting real data from the project addressing generation of unintentionally formed Persistent organic pollutants at a dumpsite in Armenia. He will come to RECETOX for a week long hands-on training 3-9 June 2018.

And we should not forget the 14th meeting of the RCEOTX summer school mentioned elsewhere in this newsletter as well as 5th summer school on Protein Engineering.

In addition, Kateřina Šebková will lecture in Kiev at another summer school focusing on sustainable development for food experts taking place 7-8 June 2018.



# RECETOX NEWS

volume VI | issue 1/2018 | spring 2018

The RECETOX News is a quarterly newsletter by the Research Centre for Toxic Compounds in the Environment (RECETOX), Masaryk University, Brno, Czech Republic.

## In this issue

### Calendar of Events

**6-8 February** 2018 Workshop on Effective Participation at Work of POPRC and CRC, RECETOX, Brno

**13 - 14 February** 2018 Project meeting Developing a Global Monitoring Plan for Exposure to and Environmental Concentration of Mercury, Rome, Italy

**5 - 9 March** 2018 Expert group meeting on mercury monitoring arrangements and elements for effectiveness evaluation framework under the Minamata Convention, Ottawa, Kanada

**13 -15 March** 2018 Second interim meeting on future of SAICM, Stockholm, Sweden

**23 - 24 March** 2018 Sub-regional cooperation of public health institutions to build capacities and strengthen information exchange to address hazardous chemicals impact in Ukraine, Belarus and in the Russian Federation, Minsk, Belarus

**8 - 14 March** 2018 Technical manual for PCB elimination in Ukraine (PCB inventory project, UNIDO), Kiev, Ukraine

**23-24 March** 2018 - Workshop on Endocrine Disruptors, Minsk, Belarus

**23.-27 March** 2018 Global Chemical Outlook and Innovation in Chemical industry in European Region, Frankfurt am Main, Germany

**16-19 April** 2018 Sharing Experience in Mercury Management, Serbian study visit, Prague, Slany and Brno, Czech Republic

**16-19 April** 2018 International Workshop on PCB Management, Moscow, Russia

**23 April** 2018 25th meeting of the National centre for Toxic Compounds Council, Prague

**23 April** 2018 6th meeting of National Panel for Human Biomonitoring (HBM4CZ), Prague

**2-4. May** 2018 Global Symposium on Soil Contamination (GSOP18), FAO, Rome, Italy

**7 May** 2018 SCRC lecture at Charles University, Prague

10-12 May 2018 NATO Advanced Research Workshop on "Environmental Health and Security in Ukrainian Conflict Zones", Kiev, Ukraine

**14-18 May** 28th meeting - SETAC, Rome, Italy

**24-25 May** 2018 Conference - Remediation Technologies XXI, Tábor, Czech Republic

**30 May - 1 June** 2018 ROG meeting for 3rd stage in POPs monitoring, Brno, Czech Republic

**3 - 9 June** 2018 Mercury inventory in Turkey, Ankara

**7-8 June** 2018 Jean Monnet Summer School - FoodPro,

**24-28 June** 2018 5th summer school on protein engineering, Brno

**ERA-Planet - iGOSP project**

**New studies at RECETOX**

**Alzheimer Disease Project**

**Activities of the Stockholm Convention Regional Centre**

## Editorial

**Dear readers of our quarterly newsletter,**

Starting the 6th year of our newsletter with this issue, we thought it is a high time to change its appearance. Why is that? It is also related to the closing of phase 1 of the Teaming project that strengthens the structure, excellence and scientific vision of our centre. We feel we have grown, changed and progressed a lot, since our first newsletter issue. In addition, this also reflects the envisioned changes at the Masaryk University. The University is preparing visual re-design and thus gets ready to celebrate its one hundredth years anniversary in 2019 and also creates new study fields in line with the changed legislation of the university education.

This RECETOX news issue features a summary information on new study programs supervised by RECETOX, showcases our inter-faculty and interdisciplinary project on the Alzheimer disease and provides more insight on iGOSP project implemented in the framework of the ERA-Planet project. Further, traditional update on the activities of the Stockholm Convention Regional Centre are also provided.

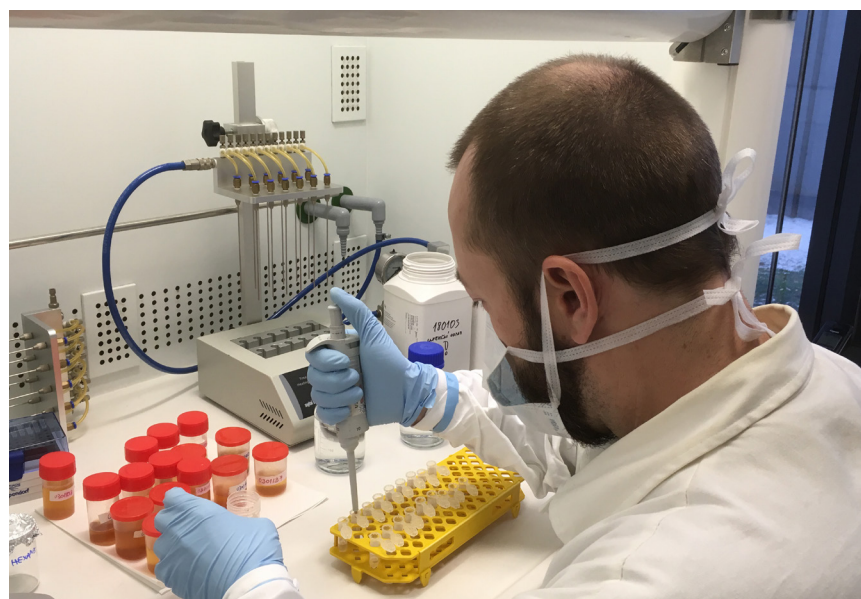
We wish you a pleasant reading,

**Katka Šebková**  
on behalf of all editors in this issue





## RECETOX Prepares New Study Programs



The Masaryk University is one of the first universities in the Czech Republic that established new rules for the set up and accreditation of study programs. New study programs and curricula will be available in autumn 2019.

The RECETOX rearranges its study programs by creating two new ones: the Environment and Health, and Computational Biology and Biomedicine for both bachelor and master degrees.

**Environment and Health.** The program is for all attracted to nature science, especially biology and chemistry, with interest in environmental issues and desire to settle environmental problems in their future jobs. For the Czech Republic, the curricula is unique due to its interdisciplinary concept and emphasis on understanding the chemical and biological essence of environmental challenges and their impacts.

**Computational Biology and Biomedicine.** Computational Biology is internationally recognized discipline using mathematical approaches in biological and medical research. It focuses on the processing, analysis and modeling of biological, clinical, physiological and epidemiological data and captures progress in modern medicine and application of mathematical and analytical approaches in biology, biomedicine and medicine. The program fosters a unique interdisciplinary collaboration between doctors, scientists

and programmers, and its outputs are useful not only in research but also in practice.

Direct sign up to these new study programs will be possible from spring 2019; in 2018, applications will be submitted to three existing programs - Environmental Chemistry, Ecotoxicology and Computational Biology. For more information, please see our website

### Participate in the CELSPAC study



The Central European Longitudinal Study of Parents and Children, CELSPAC is a unique research that studies factors affecting human health. It builds on the ELSPAC (European Longitudinal Study on Pregnancy and Childhood) organized by the World Health Organization in several European countries in 1991-2011. More than 7500 families from Brno and Znojmo joined the study in the Czech Republic. Please note that families participating in the former ELSPAC study still have the opportunity

to participate in shorter-term follow-up studies at [www.elspac.com](http://www.elspac.com).

The motto of the CELSPAC study is „for a healthy future“ and it plans to involve up to 10,000 families from Brno. New participants are joining-in gradually from 2015. The study currently focuses on all aspects that could affect the course of pregnancy, childbirth and newborn's health in the first few months of life.

If interested in signing-up and you plan to give birth in Faculty Hospitals in Brno (FN Bohunice or Obilní trh), please contact us at [info@celspac.cz](mailto:info@celspac.cz). We look forward to collaborating with you

## Awards

Gaspar Pinto (right) won the Best Poster Award at the VIB Scientific Conference „Applied Bioinformatics in Biological Sciences“ (2nd Edition) held in Leuven in March. Congratulations! The award-winning work entitled „Screening binding trajectories of two inhibitor data sets through tunnels and canals using the new CaverDock software“ is co-authored by Ondřej Vavra, Jiří Filipovic, David Bednar and Jiri Damborsky. It uses software developed in the Loschmidt Laboratory's protein



engineering team. The CaverDock is a tool for rapid analysis of transport processes in proteins. It models transport of ligand- substrate, product, inhibitor, co-factor or auxiliary solvent - from the external environment to the active or binding site of the protein and vice versa

source: Protein Databank for Europe, PDBe

## Workshop for CEE countries on effective participation in BRS expert groups

A training workshop for the Central and Eastern European and Central Asian countries to strengthen their capacities to participate effectively in meetings of the Stockholm and Rotterdam Conventions expert groups - Persistent Organic Pollutant Review Committee (POPRC) and the Chemical Review Committee (CRC) respectively was organized by SCRC Czech Republic at RECETOX premises on 6-8 February 2018.

Twenty countries of the region

participated in this very successful meeting. We would like to acknowledge in particular Kei Ohno-Woodall and Alain Witting from the Basel-Rotterdam and Stockholm Convention Secretariat as well as all current CEE members of both Committees for their engagement in demonstrating and explaining relevant tasks in group works during the workshop. We believe that such trainings will continue to be organized.



## Regional Perspective on Chemical Management



Kateřina Šebková, director of the SCRC was invited to take part in the meeting organized jointly by UN Environment and a German start-up International Sustainable Chemistry Collaborative Centre in DECHEMA, Frankfurt am Main, Germany 26-28 March 2018. This meeting attended by more than fifty participants representing European ministries of environment, health,

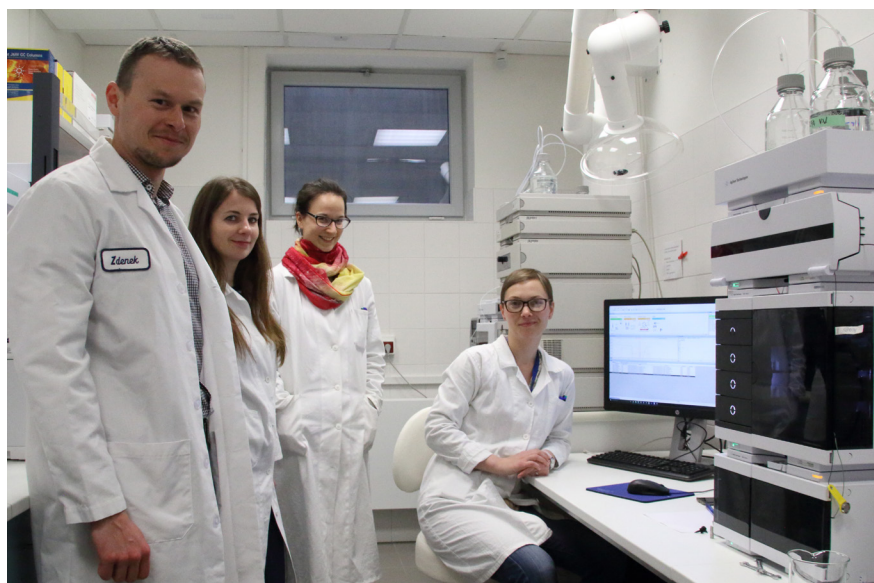
stakeholders from industry, academia and civil society of both EU and non-EU countries in Europe. They discussed future of chemical industry and its innovation, sustainability as well its current greatest challenges. Kateřina presented progress in tackling identified emerging policy issues that are dealt with under Strategic Approach to International Chemicals Management, SAICM.

## Cooperation with UNIDO Moscow Office

Professor Ivan Holoubek was invited to lecture at the international workshop entitled „Legal and practical aspects of PCBs ESM in Russia and abroad“ organized in Moscow 16-20 April 2018. He was the main speaker and his engagement in the meeting organized by the UNIDO office in Moscow represents another stage of cooperation with the Russian Federation that was interrupted for some time. There were more than 50 experts taking part in the meeting; they are predominantly from Russia, ministry representatives and PCB equipment owners who needed to gain a more profound understanding on the latest advances in sound management and disposal of the equipment contaminated by PCB. Both the organizers and participants have highly evaluated and acknowledged Ivan's lectures, expertise and practical contributions to the meeting

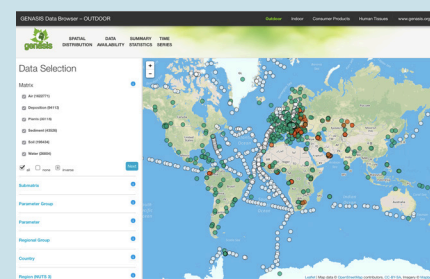






## Visit GENASIS, environmental database portal

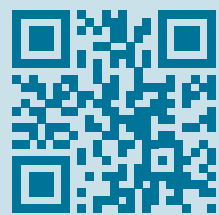
and use its data browser at [www.genasis.cz](http://www.genasis.cz) to find out more about levels of toxic chemicals around us!



The GENASIS (Global ENvironmental ASsessment Information System) created in cooperation of RECETOX with IBA MU - institutes of Masaryk University, Brno, Czech Republic - provides comprehensive information on chemical contamination of the environment, namely on persistent organic pollutants (POPs).

The system combines expertise, validated data from partner institutions, and input from regular environmental monitoring programmes. Users and data providers get secure data repository, sophisticated analytical tools, and comfortable data management and visualization.

A sister database is used globally under the Stockholm Convention and showcases an overview of global levels of POPs at [www.pops-gmp.org](http://www.pops-gmp.org).



suitable for testing hypotheses derived from the generally accepted aggregation theory.

3) Subsequently, we will apply analytical procedures to create a conceptual model that can be used in monitoring the effect of gangliosides on triggering protein aggregation and the development of AD pathology.

4) In the final phase, we will strive to investigate the impact of external factors (ie microorganisms) on the in vitro cellular model and capture the resulting pathological effects in relation to the origin of the disease.

We believe that the proposed combination of analytical technology with the in-vitro stem cell model will provide the necessary impulses for further research on Alzheimer's disease.



## RECETOX International Summer School 2018

14th session of the International Summer School on Toxic Substances in the Environment at RECETOX will be held in our premises from 18 to 22 June 2018. This year, it focuses on Smart Cities and Health and it is organized by the RECETOX research infrastructure in cooperation with the Stockholm Convention Regional Centre in the Czech Republic and Ministry of Environment of the Czech Republic. At the same period an annual meeting of the ICARUS project will take place at RECETOX and some ICARUS experts will also contribute by lectures to the summer school.

## RECETOX Publications

In 2017, RECETOX completed and published 159 research outputs; 147 of them are articles in specialized journals, two patents, seven book chapters, one book, and two other outputs. In 2018, we have already published 56 articles. A selection of six articles covering the breadth of our research until in April 2018 is shown below:

Dvorak, P.; Bednar, D.; Vanacek, P.; Balek, L.; Eiselleova, L.; Stepankova, V.; Sebestova, E.; Bosakova, M. K.; Konecna, Z.; Mazurenko, S.; Kunka, A.; Vanova, T.; Zoufalova, K.; Chaloupkova, R.; Brezovsky, J.; Krejci, P.; Prokop, Z.; Dvorak, P.; Damborsky, J. Computer-assisted engineering of hyperstable fibroblast growth factor 2. *Biotechnology and Bioengineering* (2018), 115 (4), 850-862.

Fiala, T.; Slezakova, K.; Marsalek, K.; Salvadori, K.; Sindelar, V. Thermodynamics of Halide Binding to a Neutral Bambusuril in Water and Organic Solvents. *The Journal of Organic Chemistry* (2018), 83 (4), 1903-1912.

Novak, J.; Vrana, B.; Rusina, T.; Okonki, K.; Grabic, R.; Neale, P. A.; Escher,

B. I.; Macova, M.; Ait-Aissa, S.; Creusot, N.; Allan, I.; Hilscherova, K. Effect-based monitoring of the Danube River using mobile passive sampling. *Science of The Total Environment* (2018), in press. DOI: 10.1016/j.scitotenv.2018.02.201.

Raska, J.; Ctverackova, L.; Dydowiczova, A.; Sovadinova, I.; Blaha, L.; Babica, P. Tumor-promoting cyanotoxin microcystin-LR does not induce procarcinogenic events in adult human liver stem cells. *Toxicology and Applied Pharmacology* (2018), 345, 103-113.

Chrast, L.; Chaloupkova, R.; Damborsky, J. Gram-scale production of recombinant microbial enzymes in shake flasks. *FEMS Microbiology Letters* (2018), online. DOI: 10.1093/femsle/fnx265.

Piler, P.; Svancara, J.; Kukla, L.; Pikhart, H. Role of combined prenatal and postnatal paracetamol exposure on asthma development: the Czech ELSPAC study. *Journal of Epidemiology and Community Health* (2018), 72, 349-355.

## Invitation to EmCon 2018

We would like to invite you to 6th International Conference on Emerging Contaminants (EmCon2018) that will take place in Oslo, Norway, 25 - 28 June 2018. This 6th international biennial conference is hosted by our long term research partner, the Norwegian Institute for Water Research (NIVA). EmCon series are organized bi-annually and this time it focuses on: arctic ecosystems, urban environments and megacities, oil, gas, fracking and mining, nanomaterials, micro plastics, polyfluorinated compounds (PFAS) and new contaminants on the horizon.

Since 2007, EmCon series have provided an excellent forum for presenting the latest research on all aspects related to emerging contaminants across all environmental compartments. Registration is open from April till 15 May 2018 and further information is available at [www.emcon2018.no](http://www.emcon2018.no)

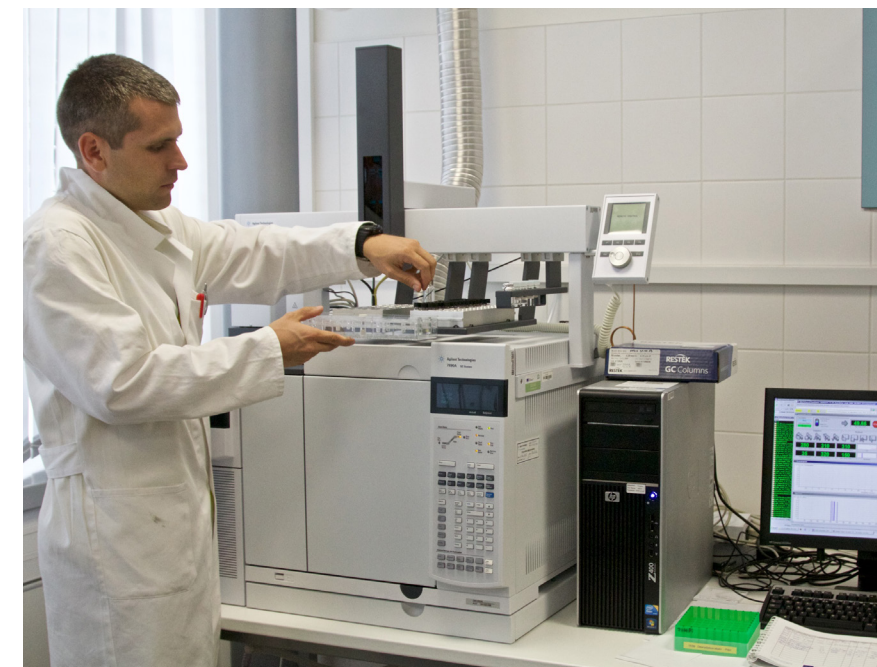
## Use the RECETOX research infrastructure capacity!

RECETOX research infrastructure provides open access (free of charge) to Czech and international researchers and experts to work on their projects and use the expertise and instrumentation available in our Centre.

Please note the following deadlines for submitting application forms or project proposals in 2018: 31 March, 30 June, 30 September, and 31 December.

Visit [www.recetox.muni.cz/RI](http://www.recetox.muni.cz/RI) for the application procedure and further relevant details.

**Should you have additional questions, please contact Petra Růžicková, coordinator of the RECETOX research infrastructure ([ruzickova@recetox.muni.cz](mailto:ruzickova@recetox.muni.cz))**





## ERA Planet: IGOSP

RECETOX has been quite successful in bidding for projects in the Horizon 2020 framework. This time, we turn to introduce you to ERA-Planet sub-project iGOSP (Integrated Global Observing Systems for Persistent Pollutants) that RECETOX implements together with partners from October 2017.

### ERA-Planet

Technology is constantly advancing, allowing environmental monitoring projects and programs around the world to generate more and more data in new fields of observation. Although these data allow us to better understand our changing planet, their increasing quantity and complexity also hinder our ability to easily share knowledge with key stakeholders and policy makers. The goal of the ERA-PLANET network is to develop transnational environmental observation systems that will provide more accurate and comprehensive support tools focusing on interoperability and data sharing in four key strands: 1) Smart Cities & Resilient Societies; 2) Resource Efficiency & Environmental Management; 3) Global Change & Environmental Treaties; and 4) Polar Areas & Natural Resources.

### iGOSP

There are research institutes from the Czech Republic, Denmark, France, Germany, Greece, Italy, Slovenia, Sweden, and Ukraine working on toxic and persistent global pollutants. Their aim is to combine atmospheric, oceanic, and terrestrial observations on mercury and persistent organic pollutants (POPs) through the integration of several European monitoring networks, modelling tools, and databases. In doing so, iGOSP will support the implementation of

the Minamata and Stockholm conventions on mercury and POP pollution, and also aid in evaluating the effectiveness of preventative and regulatory measures taken at national and global scales.

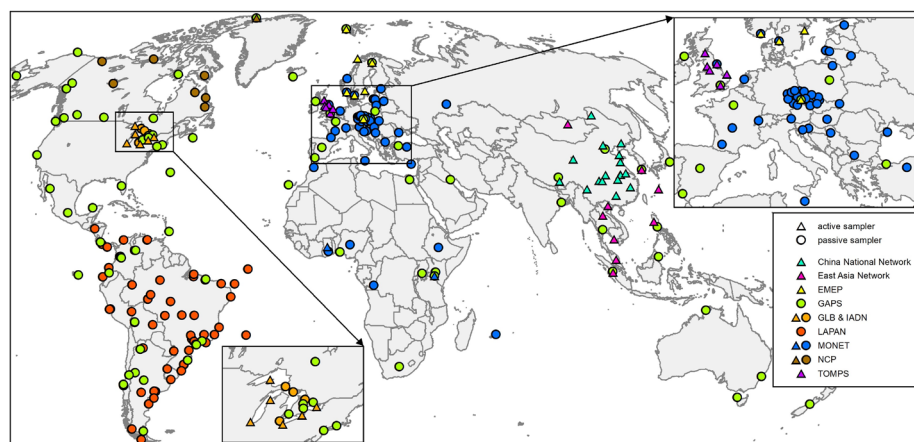
As a leader in environmental monitoring – and with our own established global environmental assessment information system (GENASIS) – RECETOX was well suited to direct the iGOSP working group on POPs monitoring. The goal of our contribution is to increase the availability and quality of information needed to track and anticipate changes in global POP concentrations, with special attention to newly listed compounds. We are also working closely with our colleagues in the mercury monitoring working group at CNR in Italy to compare and harmonize the archival, production, and sharing of data among our mercury and POP networks. Our initial work has been focused on analysing the state of current POP monitoring programs and data infrastructures in coordination with network leaders across Europe, North America, South America, Asia, and Africa. This allows us to identify the strengths and weaknesses of current global monitoring regimes, as well as data gaps that we aim to fill with the development of new services, techniques, and tools moving forwards. One of the outcomes is a map (shown below) on global distribution of monitoring sites for chemicals in the air.

**Kevin B. White** (see photo) from Canada joined RECETOX in November 2017 as part of the iGOSP project team. He is chemist and toxicologist interested in the fate and transport of contaminants in the environment. Kevin received bachelor degree in Toxicology from the



University of Guelph where he was involved in research on the effects of antimicrobial chemicals in wastewater biosolids applied to agricultural crops and on a probabilistic risk assessment of a pesticide in American groundwaters. He holds master degree from the University of Saskatchewan for investigating the aquatic geochemistry and toxicity of inorganic contaminants in surface water from an end pit lake proposed as a model for the long-term reclamation of the Canadian oil sands. Then he has also worked for an environmental consulting company (AquaTox Testing & Consulting Inc.) as well as for a federal regulatory body (Environment & Climate Change Canada). He told us: “Since all of my experience to date had been in aquatic and terrestrial environments, I had a strong desire to gain some experience in atmospheric research. I had also become pretty familiar with North American policies and regulations so I was interested in travelling abroad to expand my knowledge a bit and learn how things were done elsewhere. I learned about the ERA-PLANET project and it ended up being a perfect fit for me. Here at RECETOX, I’ve also been working on a number of side projects with Jiří Kalina analysing data in GENASIS from our MONET passive air monitoring network.”

Map on distribution of sampling sites for contaminants in the atmosphere by Ondřej Sáhka in cooperation with Kevin B. White, Jiří Kalina, Petra Příbylová, Jana Borůvková and Jana Klánová, all RECETOX.



## An interdisciplinary project on Alzheimer's disease

In December 2017, the Grant Agency of Masaryk University (GAMU) selected four projects for implementation from the category of submitted interdisciplinary research projects. We are very pleased that our project of cooperation between the Faculty of Science and Medicine succeeded. It is led by Pharm-Dr. Zdeněk Spáčil, Ph.D., who returned to RECETOX from the United States and through this project establishes his research team in our Centre. We asked him some questions:

### What brought you to RECETOX?

RECETOX offered the opportunity and space to develop an academic career at a prestigious workplace that is part of a dynamic university. My former employer, the University of Washington, also offered academic positions but the calls are extremely competitive and not very well suited to internal candidates. I decided to go for an interesting opportunity to set up my own research group and explore new research field at RECETOX rather than waiting that might not end up well.

### How does RECETOX contribute to the development of your specialization and how do you like your work here?

The RECETOX is a globally renowned institution that offers state of the art facilities, expertise and resources to focus on complex challenging scientific issues, so I'm really enjoying working here as I believe that researchers have really great opportunities at RECETOX. I also appreciate that the RECETOX administration understands the effects of the excessive bureaucracy that Europe is renowned for and is striving to relieve scientists in that regard.

### What do you expect from interdisciplinary cooperation during the project?

The project explores cooperation with the Faculty of Medicine, in particular with the Institute of Histology and Embryology contributing with unique expertise. Excellent science requires close collaboration between faculties and strengthens the position of a university in the world. I am expecting to employ our top analytical methods on an interesting

biological system with the potential to bring findings allowing to fight a severe illness. The impact of the environment on Alzheimer's disease has been, as with many other illnesses, considered crucial, so I see a great opportunity to broaden the RECETOX expertise in exposome research (a comprehensive set of factors of exposure from the environment to human health).

### Interdisciplinary Project

We would like to introduce you to the project “Transformative stem cell-based model of Alzheimer's disease and advanced analytics to study the role of membrane lipids in the pathogenesis”.

Alzheimer's disease (AD) is a neurodegenerative disease characterized by loss of neurons in the cerebral cortex and subsequent dysfunction. Currently, it is the most common cause of dementia in the elderly population worldwide (60-80% of cases), with a prevalence of about 152,700 cases per year in the Czech Republic. Diagnosed cases of AD are classified either as an early familial form (10%) or sporadic form (85-90%). While the familial form of AD is a direct consequence of a specific gene mutation, sporadic AD is more likely triggered by a combination of genetic and environmental factors such as diet and lifestyle. The pressing need to innovate approaches to research on AD to gain missing information on the pathogenesis

and treatment of AD is depicted by the failure of 413 clinical research studies on treating/curing the Alzheimer's disease between 2002-2012.

Current research is based on the concept of aggregation (clustering) of proteins in neurons, which signals the onset and development of the disease. Although many results of scientific work have been published on this topic, the mechanism of pathogenesis and potential treatment for Alzheimer's remains unclear. Thus we decided to apply modern and highly specific analytical mass spectrometry techniques in our project through a newly created in vitro stem-cell model expected to be able to capture previously unpublished aspects of neuropathology. We believe that using this new model will allow us to better test the existing hypotheses related to the aggregation mechanism and also explore the role of environmental effects (the action of microorganisms) and will therefore lead to important discoveries.

### The project can be divided into several stages:

**1)** In the first phase, development of advanced analytical tools based on liquid chromatography and mass spectrometry will take place. They are suitable for determining the levels of membrane lipids (ie gangliosides) and for an accurate quantification of target proteins (ie  $\beta$ -amyloid,  $\tau$ -protein) that primarily contribute to the aggregation.

**2)** In parallel, we will create an adequate in vitro model based on the use of cerebral organoids derived from human embryonic stem cells, which will be

