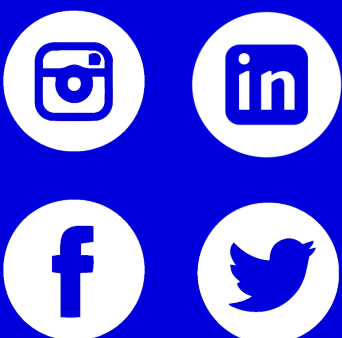# RECETOX Doctoral Conference 2023

For a healthy future

24-25 May

MUNI | RECETOX

Planning

Wednesday, May 24, 2023, RCX1

| 9:00 - 9:10 | Ludek Blaha – Welcome and introduction to PhD Conference |

SDE

| 9:10 – 11:30 | State Doctoral Exams |

SDE01 ➢ 9:10 – **Vyklická Kateřina** – Inhalation injury – molecular markers for risk stratification of early- and late- onset complications

SDE02 ➢ 9:30 – **Holotová Simona** – Biomarkers of intertissue dialogue between muscle, adipose and bone tissue

SDE03 ➢ 10:00 – **Quispe Haro Consuelo** – Social inequalities in pulmonary health

SDE04 ➢ 10:30 – **Sapunova Daria** – Advanced data analytical approaches in the estimation of bisphenols exposure determinants in cohort studies

SDE05 ➢ 11:00 – **Divinová Renata** – Application of advanced statistical methods in modeling of environmental impacts on metabolism and physiology of terrestrial plants

| 11:30 – 12:00 | Wrap-up & Voting // COFFEE BREAK |

| 12:00 – 14:00 | State Doctoral Exams |

SDE06 ➢ 12:00 – **Pinto Vidal Felipe** – Endocrine disrupting potential of compounds from indoor environment

SDE07 ➢ 12:30 – **Kumari Puja** – Toxicological characterization of the interference of chemicals with thyroid hormone regulation

Planning

SDE08   ➤   13:00 – **Ryšavá Tereza** – Novel approaches for the assessment of the effects on thyroid hormone homeostasis and neurodevelopment

SDE09   ➤   13:30 – **Brenner Daniela Katja** – Metabolomic and toxicokinetic approach to improve in vitro toxicity assessment and in vitro in vivo extrapolation

SDE10   ➤   14:00 – **Mlnaříková Marie** – Fish cell lines and their uses in aquatic ecotoxicology

14:30 – 16:00	Category A (students in years of study 1-2)

P01   ➤   **Contini Thomas** – Deciphering the human prenatal exposome using HRMS and placenta

P02   ➤   **Dvořák Tadeáš** - Urban environments, stress and its biomarkers

P03   ➤   **Edebali Özge** – Characterising the link between indoor air dust and textile contamination

P04   ➤   **Gregor Petr** - Exposure to perfluoroalkyl substances and thyroid function in firefighters

P05   ➤   **Kohout Pavel** - Design of novel proteins from latent spaces of variational autoencoders

P06   ➤   **Mičan Jan** - Protein engineering of staphylokinase with improved thrombolysis

P07   ➤   **Mlčůchová Natálie** – Microbiome and pharmacotherapy in patients with gastrointestinal disorders

| P08 | ➤ | **Seličová Hana** - Automated functional metabolomics and application to case-control disease studies |

| P09 | ➤ | **Vašková Aneta** - ApoE, an enigmatic cellular player in neurodegeneration |

| 16:00 | End of Poster Evaluation (Category A) |

| 16:15 | Best Poster announcement (Category A) |

Thursday, May 25, 2023, RCX1

| 9:00 - 9:05 | Ludek Blaha – Welcome to 2nd day of PhD Conference |

| 9:05 - 9:30 | Kuchovská Eliška – What I wish I'd known when I started my PhD |

SDE

| 9:30 – 11:00 | State Doctoral Exams |

| SDE11 | ➤ | 9:30 – **Kouba Petr** – Machine learning for protein dynamics |

| SDE12 | ➤ | 10:00 – **Haddadi Faraneh**– Capturing protein dynamics and its determinants using explainable artificial intelligence |

| SDE13 | ➤ | 10:30 – **Horáčková Jana** – Analysis of luciferase enzymes by molecular modeling |

| 11:00 – 11:30 | Wrap-up & Voting // COFFEE BREAK |

| 11:30 – 14:00 | State Doctoral Exams |

Planning

SDE14   ➢   11:30 – **Jbebli Akrem** – Strategies for small volume chemical analysis

SDE15   ➢   12:00 – **Strada Rebecca**– Near-infrared emitting polymethine dyes for fluorescent imaging

SDE16   ➢   12:30 – **Ng Kelsey Kwong Pui** – Bridging chemical exposure to effect assessment

SDE17   ➢   13:00 – **Svobodová Petra** – Chemicals of concern in vehicles

SDE18   ➢   13:30 – **Sabzevari Shiva** – The assessment of plant protection products input into the environment and their related risks

Poster Session

14:00 – 16:00	Category B (students in years of study 3-4)

P10   ➢   **Bartošková Anna** - The explanation of educational disparities in adiposity by lifestlyle socioeconomic and mental health mediators

P11   ➢   **Eghbalinejad Mahleh** - The importance of a comprehensive toxicity assessment of nanopesticides in the environment: comparing toxic effects of tebuconazole in different formulations on the nematode *C. elegans*

P12   ➢   **Felipe Grosso Marina** - Assessing steatosis-related effects of endocrine disruptors: a comparative study of 2D and 3D in vitro approaches

P13   ➢   **Hecht Helge** - Reproducible and scalable annotation of fragmentation spectra using the matchms Galaxy tools ecosystem

P14   ➢   **Hrežová Eliška** - Maternal prenatal vitamin B12 intake and child cognitive development

Planning

P15   ➤   **Hrivňáková Martina** - The mosaic within: unraveling intratumor heterogeneity in colorectal cancer

P16   ➤   **Kizovský Martin** – Raman spectroscopy in environmental research

P17   ➤   **Krupčíková Simona** - Investigation of emerging aquatic contaminants emissions in municipal wastewaters using passive sampling

P18   ➤   **Liu Runze** - Developing a battery of in vitro assays targeting key molecular initiation events in thyroid hormone regulation to assess thyroid hormone-disrupting chemicals

P19   ➤   **Marcineková Paula** - Supramolecular solvent-based extraction method for the determination of a wide-range of legacy and emerging environmental contaminants in indoor dust

P20   ➤   **Mayer Ludovic Thierry** - Long-range atmospheric transport of currently-used pesticides over Europe

P21   ➤   **Mikušová Petra** - Pull-down assay as a novel approach for the identification of compounds interfering with thyroid hormone signalling in complex environmental mixtures

P22   ➤   **Pálešová Nina** - Liver on fire? Exposure to PFAS and PAHs in relation to cardiometabolic health (CELSPAC-FIREexpo STUDY)

P23   ➤   **Phan Audrey, Xuan-Anh** - Adverse outcome pathway linking nuclear receptor overactivation to feeding disruption

P24   ➤   **Pivrncová Eliška** - The effect of intrapartum antibiotics prophylaxis on neonatal gut and oral bacteriome

P25   ➤   **Ráčková Lucie** - A novel method of stress measurement based on thermodynamics. Results from the chill ice ii space analog mission

Planning

P26   ➢   **Roy Chowdhury Riju** - Study on the effects of cyanotoxins using advanced 3D in vitro liver model

P27   ➢   **Rudzanová Barbora** - Impact of PFAS exposure on human immunity

P28   ➢   **Suchánková Lenka** - A seven-years based characterisation of aerosol light scattering properties at Central European rural site: variability and source apportionment

P29   ➢   **Velecký Jan** - Protein Learning for Solubility Design

P30   ➢   **Vespalcová Hana** - Transcriptomic profiling of asthma, atopic eczema and allergies and their combinations in Czech adult population

P31   ➢   **Virmani Ishita** - The toxic cocktail: how organochlorine chemicals disrupt lipid metabolism in testicular Leydig cells and lead to hormonal disbalance

16:00	End of Poster Evaluation (Category B)

16:15	Best Poster announcement (Category B)

DAY 1

24.05.2023

Posters evaluation

Day 1: Link and QR code for Posters evaluation

- https://muni.cz/go/798b7d

RECETOX PhD Conference:
Day 1

Poster Evaluation Form

24th May 2023

Abstracts

SDE01 — Inhalation injury – molecular markers for risk stratification of early- and late- onset complications

Vyklická Kateřina

Inhalation injury (INHI) is defined as an acute airway injury caused by inhalation of hot steam and/or products of combustion. This complex project was designed as a prospective study monitoring individual patient clinical and molecular parameters during hospitalization. Samples of several matrices (buccal and oropharyngeal swabs, bronchoalveolar lavage - BAL, urine, and blood) for subsequent molecular analyses are collected at 6 time points. The main aims are: i) to determine the microbiome and antibiotic resistance genes in several matrices and time points; ii) to select specific miRNAs correlating with INHI using RNAseq analysis, and iii) to characterize toxic compounds in BAL and urine.

SDE02 — Biomarkers of intertissue dialogue between muscle, adipose and bone tissue

Holotová Simona

This thesis aims to identify biomarkers that facilitate inter-tissue communication between muscle, adipose, and bone tissues in humans. The goal is to investigate protein networks associated with the pathophysiological processes of these tissues, namely sarcopenia, osteoporosis, and obesity, using both untargeted and targeted proteomic methods. The main outcome of this study will be the analysis of multi-tissue interactions, including an assessment of the influence of selected clinical factors such as age, physical fitness, and body composition. The overarching objective of this thesis is to enhance our comprehension of the molecular mechanisms at the intersection of sarcopenia, osteoporosis, and obesity in different specific populations and identify potential biomarkers for further research.

SDE03 — Social Inequalities in pulmonary health

Quispe Haro Consuelo

Research from the United States and Western Europe have described the effect of social determinants of health including environmental factors on lung function, but are these findings analogous to Central and Eastern Europe?
My aim is to analyze the associations between pulmonary health outcomes and social determinants of health and environmental pollution during the life-course of the Central European population.
Using The Health, Alcohol, and Psychosocial factors In Eastern Europe (HAPIEE) study, I am going to perform multiple logistic regression, structural equation modeling, and hierarchical linear regression to describe the main predictors of impaired lung function.

Abstracts

SDE04 — Advanced data analytical approaches in the estimation of bisphenols exposure determinants in cohort studies

Sapunova Daria

Bisphenol A (BPA) and its replacements bisphenols S and F (BPS and BPF) are man-made compounds, widely used as plasticizers in plastic materials and in the manufacture of epoxy resins. Their endocrine-disrupting properties are of concern due to the broad use of consumer products containing bisphenols in everyday life. In this study, we utilized data of four Czech cohorts: two cohorts (teenagers and young adults) of the CELSPAC project, a cohort of school children, and mother-child pairs from the DEMOCOPHES cohort; the total n = 1383. BPA, BPS and BPF levels were determined in the urine of the participants using LC-MS. All participants filled a questionnaire aiming to indicate potential bisphenols exposure in the Czech population . Data from the questionnaires were used as predictors of the bisphenols exposure in statistical models consisting of principal component analysis and different types of multiple linear regression with a reduction of the confounding variables impact.

SDE05 — Application of advanced statistical methods in modeling of environmental impacts on metabolism and physiology of terrestrial plants

Divinová Renata

Environmental factors such as atmospheric carbon dioxide concentration, temperature, and water availability affect not only terrestrial plants but ultimately all life on Earth. My objective is to investigate how these factors and mineral nutrition affect the metabolome of dominant tree species and how such changes can contribute to 'cross-tolerance' against other subsequent stressors such as ultraviolet (UV) radiation. To achieve this, I aim to develop a mathematically described metabolic fingerprint, which reflects the chemical imprint of environmental conditions, and then connect this information with physiological parameters. I will employ various techniques including metabolomics, multivariate statistics, pathway analysis, and mathematical modeling to accomplish this.

SDE06 — Endocrine disrupting potential of compounds from indoor environment

Pinto Vidal Felipe

Previous studies documented a wide spectrum of pollutants in indoor environments. The presence of various sources of chemicals together with the long-time people spent indoors enhance the relevance of this exposure. This study aims to provide a comprehensive toxicological profile of chemical mixtures associated with indoor dust from seven microenvironment types. The dust samples were extracted with different methods, including a simulation of gastrointestinal tract processing. The extracts were assessed for relevant endocrine-disrupting potentials using a battery of bioassays. The mixtures from different microenvironments interfered with estrogen, androgen, glucocorticoid, and thyroid hormone receptor signaling as well as thyroid hormone transport.

Abstracts

SDE07

Toxicological characterization of the interference of chemicals with thyroid hormone regulation

Kumari Puja

Thyroid hormones (TH) are essential for vertebrate growth and development. TH-disrupting chemicals (TDCs) have been linked to various disorders across many species. This study focuses namely on a crucial step in TH synthesis, iodide uptake in thyroid cells through Na+/I− symporter (NIS) protein. Bioassay was developed to assess effects on this crucial mechanism. Human cell lines overexpressing NIS were compared to a rat thyroid cell model. Sequence Alignment to Predict Across Species Susceptibility characterized high conservation of NIS protein across vertebrate species. The assay was augmented with external biotransformation system to increase physiological relevance and applied to investigate effects of prioritized chemicals and environmental samples.

SDE08

Novel approaches for the assessment of the effects on thyroid hormone homeostasis and neurodevelopment

Ryšavá Tereza

Disruption of the thyroid hormone (TH) system leads to adverse effects, especially during fetal neurodevelopment. The activity of deiodinases, which regulate TH levels, can be altered by various compounds, such as environmental pollutants and drugs. Yet, there is no reliable in vitro method available to assess the impact of chemicals on DIO activity. This project aims to develop in vitro methods that can characterize the effects of different compounds on TH regulation and neurodevelopment. This involves creating transfected in vitro models with overexpression of DIOs to measure their activity through the Sandell-Kolthoff reaction. Furthermore, an advanced neurodevelopmental model will be established to evaluate the impact of chemical exposure on brain development and TH disruption.

SDE09

Metabolomic and toxicokinetic approach to improve in vitro toxicity assessment and in vitro in vivo extrapolation

Brenner Daniela Katja

Toxicological hazard and risk assessment of chemicals is essential to maintain a healthy environment for both humans and wildlife. Exposure to chemicals, whether acute or chronic, can lead to diseases such as nonalcoholic fatty liver disease (NAFLD). Poly- and perfluoroalkyl substances (PFAS), commonly referred to as "forever chemicals" due to their environmental persistency, are suspected of causing NAFLD. In the present work, 2- and 3-dimensional in vitro liver HepG2 models and in silico models are used to (i) investigate the contribution of PFAS to the development of NAFLD, and (ii) explore cellular and molecular mechanisms involved using NMR metabolomics.

Abstracts

SDE10 **Fish cell lines and their uses in aquatic ecotoxicology**

<u>Mlnaříková Marie</u>

This thesis examines alternatives to Acute Fish Toxicity Test (AFT) with the potential to reduce and eventually replace this test. Cell line assay with RTgill-W1 has the ability to predict AFT results, as is shown in the validation round-robin study. Further, this cell line was studied in regard to pharmaceutical testing along with the FET alternative. Mixture effects of azoles and β-naphthoflavone were studied on biomarker CYP1A in PLHC-1 cell line with the application of the obtained data for the toxicokinetic model. Understanding of mixture effects and their modeling can be used as a tool for pre-selection and prioritization of substances where animal testing is irreplaceable.

P01 **Deciphering the human prenatal exposome using HRMS and placenta**

<u>Contini Thomas</u>

The placenta is a promising matrix to study exposure of the fetus to xenobiotics during pregnancy but remains underexplored for exposure assessment. Profiling of placenta using high-resolution mass spectrometry (HRMS) would enable the characterization of accumulating exogenous chemicals and identification of associated perturbations in biochemical pathways. However, the placenta is a large organ with tissues of different origins and the spatial distribution of chemicals remains unknown. Currently no standardized method exists for placenta sampling. The main objective is to study variability of chemical distribution in placenta using HRMS methodologies in order to develop a standardized sampling protocol for future large-scale applications in cohorts.

P02 **Urban environments, stress and its biomarkers**

<u>Dvořák Tadeáš</u>

Urban stress is a bodily and mental response to stimulation in urban environments. We can measure this response using cardiorespiratory or neurophysiological methods and observe changes in heart rate variability, brain activity and other biomarkers. Few studies have investigated what environmental parameters drive urban stress. We aim to establish if the underlying geometry of urban spaces and its metabolic demands on the visual system contribute to urban stress. In a set of real-world and laboratory experiments, participants will be exposed to built and green spaces with different low-level geometric parameters. Findings could reveal geometric patterns that reduce stress, contributing to healthier urban environments.

Abstracts

P03

Characterising the link between indoor air dust and textile contamination

Edebali Özge

The doctoral thesis aims to investigate the entry of aromatic amines (AAs) into water bodies from indoor environments and to characterize the link between indoor air, dust, and textiles. AAs are emitted from various indoor sources and can sorb from textiles, which can release the chemicals during laundering and discharge them into water systems. The thesis will characterize the emissions of AAs to indoor air and dust levels and their uptake from indoor air to textiles. Samples of air and dust will be taken from the hairdresser's salon, smoking pubs and houses, restaurant kitchens, and non-smoking houses. Textiles will also be used as a passive air sampler.

P04

Exposure to perfluoroalkyl substances and thyroid function in firefighters

Gregor Petr

This study investigated the exposure levels of per- and polyfluorinated alkyl substances (PFAS) in professional firefighters, freshly recruited firefighters, and a control group. The study aimed to determine whether PFAS impair thyroid hormone homeostasis and whether the associations between PFAS and thyroid hormones are modulated by iodine deficiency. The findings suggest a potential relationship between serum levels of PFAS and thyroid hormones in the three different groups, indicating that exposure to PFAS may be associated with disruptions in thyroid function. To our knowledge, this is the first study to investigate the associations among an extended list of PFAS, thyroid hormones, and iodine concentration in a group of differently PFAS-exposed males.

P05

Design of novel proteins from latent spaces of variational autoencoders

Kohout Pavel

Proteins are often exposed to harsh and unnatural conditions in industrial applications, making it necessary to modify their properties. Protein engineering can enhance protein performance and make them more suitable for industrial use, with unsupervised machine learning enabling the use of a large amount of unannotated biological data. Latent space-based models, such as variational autoencoders (VAEs), map input proteins into internal coordinate space, and the structure of this latent space can thus reveal their meaningful representations. This information can be used to guide the search space in rational protein design by suggesting new protein sequences or identifying important residues for mutations.

P06	**Protein engineering of staphylokinase with improved thrombolysis**

Mičan Jan

Staphylokinase is an easy-to-produce protein that offers a way to treat blood clot-caused diseases such as ischemic stroke. In this study, we performed computational design of staphylokinase's protein-protein interface with plasmin to improve its affinity to plasmin and efficiency. We selected four mutants (SAK01-04) for experimental characterization. SAK01 has shown sixfold higher plasmin affinity and nine times higher selectivity than wild-type staphylokinase. SAK01 also has slightly higher fibrinolytic effectivity. SAK01 has proved that computational design can improve staphylokinase's affinity to plasmin and translate to better thrombolytic efficiency. Prospectively, we aim to create improved mutants using rational design and other methods.

P07	**Microbiome and pharmacotherapy in patients with gastrointestinal disorders**

Mlčůchová Natálie

Background: Etiopathogenesis of gastrointestinal disorders (GDs), such as gastroesophageal reflux disease (GERD) and its complications, pancreatic cancer (PANC), and colorectal adenocarcinoma (CRC) is multifactorial; risk factors for disease development and/or progression include external factors, dysbiosis of host microbiota, genetic predisposition, and responsiveness to therapy. Objectives: The main aim of the dissertation project is to identify potential markers at the level of the host microbiome. Methods: Human and microbial DNA will be isolated from blood and biopsies from the digestive tract. Microbial DNA will be analyzed by 16S rRNA amplicon sequencing and quantified by multiplex qPCR method. Outcomes: Paired comparison of bacteriomes between healthy and pathological parts of the digestive tract will be performed to identify potentially risky host bacteriome profiles.

P08	**Automated functional metabolomics and application to case-control disease studies**

Seličová Hana

Human - gut microbiome interplay has a bidirectional influence on health. However, drug-nutrient interactions are understudied, partly due to limited methodologies for comprehensive analysis. Biotransformation products of pharmaceutical drugs will be generated using one-pot chemical synthesis, biomimetic reaction kits and recombinant yeast expression systems. Characterized products will be added to a high-resolution reference mass spectral library resource for enhancing annotation in metabolomics studies. A simultaneous discovery and quantification (SQUAD) assay, targeting short chain fatty acids, will be established for metabolomic profiling of human-gut microbiota crosstalk. In combination, these tools will progress the comprehensive analysis of drug-nutrient interactions in clinical cohorts.

P09

ApoE, an enigmatic cellular player in neurodegeneration

Vašková Aneta

Apolipoprotein E (ApoE) is a 299-residue glycoprotein that plays an enigmatic role in neurodegeneration. It can undergo fragmentation and forms insoluble aggregates (especially ApoE4 isoform), which are a major hallmark of the neurodegenerative process. ApoE fragments are capable of overcoming the nuclear membrane and translocating to the cell nucleus. Surprisingly, the N-terminal domain of ApoE is able to interact with DNA. In this project, we aim to decipher a mode of molecular recognition of double-stranded DNA by ApoE fragments, and its cellular consequences. To do this, we employ protein biochemistry and structural biology techniques to reconstitute and visualize ApoE-DNA complexes. Complementary, we will use cell-based assays to probe the transcription-deregulation activity of ApoE proteins and its prevention through small-molecule modulators.

DAY 2
25.05.2023

Posters evaluation
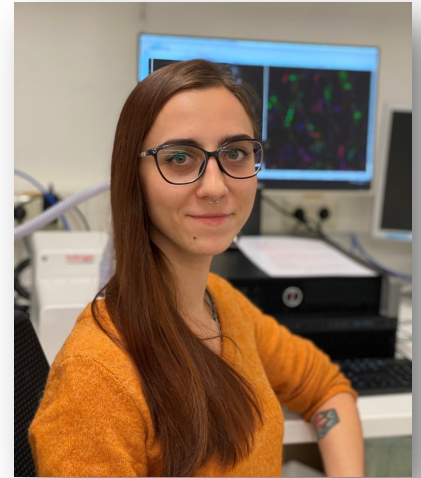
Day 2: Link and QR code for Posters evaluation

- https://muni.cz/go/1b104f

RECETOX PhD Conference:
Day 2

Poster Evaluation Form

25th May 2023

Eliska Kuchovska

IUF - Leibniz Research Institute for
Environmental Medicine, Düsseldorf,
Germany
Postdoctoral researcher

What I wish I'd known when I started my PhD

What aspects of Ph.D. life are crucial for our professional future? Is building our professional network necessary already during the studies and how to do it? Should we focus all our time on accumulating experiments or could we squeeze in some science communication activities? How to communicate science and which tools to use? And finally, could social media be beneficial for your scientific activities or are they just a waste of time?

Biography

Eliska Kuchovska graduated with a double Ph.D. degree from the University of Bordeaux (France) and Masaryk University (Czech Republic, RECETOX) in environmental health sciences focusing on the developmental toxicity towards aquatic non-target organisms. She received the Vice-Chancellor's Award for Excellence in Doctoral Studies. After her studies, she moved to Germany and became a developmental neurotoxicologist striving to develop and promote new approach methodologies in the framework of the European H2020 ONTOX project. She is an enthusiastic early-career researcher often engaging in science communication activities to raise public awareness.

🧠🧪🔬 Developmental neurotoxicologist
🎤🎬👩 Science communication and dissemination lover
❌🐀❌ Animal-free toxicity testing supporter

Abstracts

SDE11	**Machine learning for protein dynamics**

Kouba Petr

The study of proteins is crucial for both fundamental understanding of life as well as for practical applications in biotechnology and drug discovery. Very often, the key for getting insights about a protein and its function is to study its dynamics.

I am tackling the challenge of studying protein dynamics by using the methods of Machine Learning (ML). In particular, I employ neural networks for analysis of molecular dynamics simulations of proteins and I study the state-of-the-art methods in ML for protein design, searching for ways of incorporating considerations of dynamics into design of protein sequences.

SDE12	**Capturing protein dynamics and its determinants using explainable artificial intelligence**

Haddadi Faraneh

While it has proven instrumental in understanding biocatalysis, the analysis of generated data is often manual and subject to human bias and error. On the other hand, explainable artificial intelligence (XAI) can extract meaningful information automatically and rigorously. The main objective of my project is to use XAI to extract valuable information from molecular dynamics simulations to guide protein engineering. I will primarily focus on the Layer-wise Relevance Propagation method and use it for the designs processed by LoopGrafter for transplanting loops between proteins or CAVER for analyzing protein tunnels.

SDE13	**Analysis of luciferase enzymes by molecular modeling**

Horáčková Jana

Bioluminescent luciferase enzymes have numerous applications in biotechnology and biomedicine, serving as reporter genes, biosensors, and cancer phototherapy agents. The fascinating ability to emit light has been observed in over 10,000 species and has evolved independently several times in bacteria, animals, and fungi. However, only seven luciferase-luciferin pairs have been characterized, and the catalytic principles remain underexplored. This study aims to analyze luciferases from different marine organisms, including deep-sea shrimp Oplophorus, sea pansy Renilla, and brittle star Amphiura, using molecular modeling methods such as docking and molecular dynamics. By complementing these findings with crystallographic and kinetic experiments, we can lay the foundation for developing superior future luciferases.

Abstracts

SDE14

Strategies for small volume chemical analysis

Jbebli Akrem

Mass spectrometry (MS) based metabolomics to measure the endogenous and exogenous small molecules in biospecimen provides a snapshot of molecular phenotype that is a composite of genetic and environmental factors. Gas chromatography (GC) coupled to Orbitrap MS enables sensitive, accurate mass measurement. Herein, a high-throughput method for metabolomic profiling of dried blood spots (DBS) has been developed. A direct two-stage derivatisation procedure has been optimised and automated, providing sample analysis time of ~20 mins. The detection of 60 biologically relevant metabolites is confirmed and further work will focus upon enhancing annotation coverage, quantitative validation and application to a clinical cohort.

SDE15

Near-infrared emitting polymethine dyes for fluorescent imaging

Strada Rebecca

Optical imaging in the so-called tissue transparent window (650—950 nm), where the mammals' tissues absorption is minimal, is one of the most important visualization techniques and is attracting increasing attention. Heptamethine dyes, such as cyanines and croconaines, are promising scaffolds emitting fluorescence in this spectral region. The aims of my project are to synthesize new heptamethine scaffolds, examine their photophysical properties and explore their applicability. Moreover, selected cyanines are also conjugated with antibodies and tested in a model immunofluorescence assay.

SDE16

Bridging chemical exposure to effect assessment

Ng Kelsey Kwong Pui

Contaminants of emerging concerns (CECs) are constantly released to the environment from anthropogenic activities. With the chemical occurrence data obtained from target and suspect screening, prioritization of these chemical is a task of primary importance for environmental managers and decision-makers to mitigate and manage the environmental risk. In the present study, the NORMAN prioritization scheme was applied to the chemical occurrence data obtained from target and suspect screening on the environmental samples collected in the Danube River Basin and other European countries. Multiple chemical classes have been analysed, including 4,777 per- and polyfluoroalkyl substances (PFAS) and 676 antibiotics. The investigation resulted in over 20 prioritized substances, which require systematic monitoring and strategic management.

Abstracts

SDE17

Chemicals of concern in vehicles

Svobodová Petra

Numerous studies have identified higher levels of plastic additives in vehicle dust than in other indoor microenvironments, and exposure to vehicle air (particular with high VOC content) has been associated in health impacts. We deal with a preliminary study, proof or denial of the influence the age of car vehicles on the concentration or content of plastic additives, like flame retardants, in the interior of similar model passenger vehicles, given the importance of human exposure in cars. At the same time we investigate whether substances are present in different concentrations in different places in the car (dashboard, seats and trunk). We try to compare this with the results from other studies. With this we want to find out if it is necessary to perform composite samples. Based on this we want to find out whether the established formulas correspond with what is expected based on regulations and literature or chemical databases.

SDE18

The assessment of plant protection products input into the environment and their related risks

Sabzevari Shiva

Of all pesticides applied to crops, it has been claimed that a very small part (less than 0.1%) reaches the target organism while the rest of it contaminates the surrounding area (soil, water, and atmosphere) via different routes. In this research plan, by collecting the data related to PPPs' application and usage from European countries, an estimation on the amount of PPP's active substances inserted into the environment will be obtained at both regional and country level.
The predicted pesticide input to the environment as generalized application patterns and modelled pesticide concentrations in the environmental compartments (soil-water-air) will be visualized in the form of regional and national maps.

P10

The explanation of educational disparities in adiposity by lifestlyle socioeconomic and mental health mediators

Bartošková Anna

Background: the inverse association between education and obesity is well-known. However, education level per se is not directly related to obesity. Therefore, this study aims to assess diverse mediators in the educational disparities in adiposity. Methods: in total, 2154 participants aged 25-64 years. Adiposity assessment was based on 4 adiposity biomarkers. The mediation potential of 8 factors was assessed in the multiple mediation model. Results: in women, the negative indirect effect was significant via dietary risk, alcohol intake, income, and mental health. In both sexes, we observed a positive significant indirect effect via sedentary behaviors, suggesting that sedentary behaviors reduce the protective potential of higher educational levels on adiposity.

Abstracts

The importance of a comprehensive toxicity assessment of nanopesticides in the environment: comparing toxic effects of tebuconazole in different formulations on the nematode *C. elegans*

Eghbalinejad Mahleh

Nanotechnology in agriculture is offering chances to develop more effective pesticides by improving the functionality of active substances, in addition to changing their environmental fate and risk. We prepared, characterized different formulations of nanopesticide and their risks toward Caenorhabditis elegans were assessed. Toxicity assessment of different formulations of TBZ showed varying effects. NFs showed higher toxicity on C. elegans. Experiments with the pure carriers revealed that the higher toxicity of Lipid- based nanoformulation was mainly due to stronger effects of lipid carrier compared to polymeric carriers, suggesting mixture toxicity of nanoparticles and active substance. Overall, these in vivo tests highlight that comprehensive toxicity testing of NPs is required to allow a reliable risk assessment.

Assessing steatosis-related effects of endocrine disruptors: a comparative study of 2D and 3D in vitro approaches

Felipe Grosso Marina

Non-alcoholic fatty liver disease (NAFLD) is a prevalent metabolic disorder characterized by the accumulation of triglycerides in liver cells. Recent evidence suggests that exposure to endocrine-disrupting environmental pollutants (EDs) may contribute to the development of NAFLD. However, current in vitro testing methods have limited ability to assess the "steatogenic potential" of EDs and related health hazards. To address this issue, a study tested the effects of ten selected EDs on human liver cell viability, lipid droplet accumulation, and altered expression of lipid metabolism genes using 2D and 3D models of HepG2 cells. The EDs tested included Bisphenols, Phthalates, Polyfluoroalkyl substances, Cadmium chloride, Pesticides, and Butyl-paraben…

Reproducible and scalable annotation of fragmentation spectra using the matchms Galaxy tools ecosystem

Hecht Helge

Annotation of spectra with a chemical identity is considered as one of the bottlenecks in mass spectrometry-based omics disciplines. Compound identity can be assigned based on scores from matching experimentally acquired spectra to references in a spectral library. The matchms python library has fostered the development of a larger ecosystem of connected tools focusing on matching of fragmentation spectra for compound identification. This includes machine learning based scores such as Spec2Vec and MS2DeepScore as well as other means of compound identification, such as molecular networking or analog search (MS2Query). We are taking the functionalities of matchms – spectral matching, molecular networking, and spectral library processing to the cloud with the matchms Galaxy tool suite for reproducible and scalable compound identification.

Abstracts

P14

Maternal prenatal vitamin B12 intake and child cognitive development

Hrežová Eliška

The association between prenatal vitamin B12 intake and cognitive functioning in children is unclear. We examined such association in Czech part of European Longitudinal Study of Pregnancy and Childhood. Dietary data was measured using food frequency questionnaire. Parents reported on their child´s speech and language development at 18 months, 3, 5, and 7 years of age. Intelligence Quotient (IQ) was measured at the individual examination of children at 8 years. Data were analysed using multiple linear and logistic regression models. Children of mothers with higher B12 intake scored better in speech and language tests and had higher IQ than children of mothers with lower B12 intake in fully adjusted models.

P15

The mosaic within: unraveling intratumor heterogeneity in colorectal cancer

Hrivňáková Martina

Colorectal cancer (CRC) is a highly heterogeneous disease, posing challenges for treatment and classification. Selection of representative regions enriched in tumoral cells is crucial for profiling solid tumors, as gene expression analysis in tissue sections is biased towards the most abundant cell types, while less abundant ones are often overlooked. We investigated the relationship between gene expression and tumor morphology in 111 colon cancer samples. The results reveal comprehensive changes in molecular pathways across different morphotypes, indicating a continuum of molecular characteristics. This study highlights the importance of considering tumor heterogeneity in molecular classification and provides insights into the molecular landscape of CRC

P16

Raman spectroscopy in environmental research

Martin Kizovský

Raman microspectroscopy combined with microfluidic systems is useful for quasi-continuous flow-through analysis of liquid or suspended samples, such as microorganisms, micro and nanoplastics, and chemical pollutants. It is a non-destructive, fast, simple, and versatile method suitable for many applications. I employed several Raman microspectroscopy techniques to detect a variety of environmentally-relevent analytes, namely: 1) Detection of selenium content in microalgae Chlorella vulgaris by conventional Raman microspectroscopy. 2) Detection of submilimolar concentrations of glycerol using high-power Raman microspectroscope. The method was optimized for future monitoring of 1,2,3-trichloropropane enzymatic dehalogenation. 3) Detection of micro and nanoplastics using optical micromanipulation methods…

P17

Investigation of emerging aquatic contaminants emissions in municipal wastewaters using passive sampling

Krupčíková Simona

My project aims to develop a method for monitoring aromatic amines (AAs) in wastewaters and recipient surface water using passive sampling. The design of passive sampler (PS) is based on a combination of a suitable adsorbent and a diffusive hydrogel layer.

The diffusion of AAs through 1.5% agarose hydrogel is characterized by gel stacking method at the different pH values regarding the pH-dependent dissociation of AAs.

Solid phase extraction method for water samples analysis is developed and optimized using Empore disks SDB-RPS as a sorbent. Nine out of twenty AAs were detected. Using Empore disks SDB-RPS based PS, more AAs (fifteen) are detected in screening at the wastewater treatment plant in Modřice.

P18

Developing a battery of in vitro assays targeting key molecular initiation events in thyroid hormone regulation to assess thyroid hormone-disrupting chemicals

Liu Runze

This study developed and optimized in vitro assays to evaluate potential thyroid hormone-disrupting chemicals (TDCs) using an adverse outcome pathway (AOP) network approach. The battery addresses priority molecular initiation events (MIEs) in thyroid hormone regulation, including thyroperoxidase (TPO) inhibition and thyroxine-transthyretin (T4-TTR) displacement. The effects of TDCs on TH receptor signalling and AhR-mediated activity involved in TH metabolism were also assessed. The battery was employed to characterize effects of 20 prioritised chemicals with human exposure relevance, including environmental pollutants, natural compounds, and pharmaceuticals. These assays can reduce animal testing and indicate TDCs of risk to human and wildlife health.

P19

Supramolecular solvent-based extraction method for the determination of a wide-range of legacy and emerging environmental contaminants in indoor dust

Marcineková Paula

Indoor environments are contaminated with synthetic chemicals, posing a constant exposure risk to humans. While we have some knowledge about legacy pollutants found in indoor dust, there is limited understanding of emerging contaminants. To address this, our study aimed to develop an efficient extraction method using supramolecular solvents (SUPRAS) to capture a wide range of pollutants in house dust. We examined seven different SUPRAS mixtures for their extraction effectiveness across various targeted chemical classes, employing LC-MS and GC-MS for detection. Results revealed recoveries ranging from 40-60% for volatile compounds and up to 90% for less volatile ones. The remarkable advantage of SUPRAS lies in its ability to simultaneously extract compounds of different polarities, maintaining a low SUPRAS-to-sample ratio. These SUPRAS extracts enable suspect screening and non-target analysis, facilitating the detection of previously unknown pollutants in indoor environments.

Abstracts

P20

Long-range atmospheric transport of currently-used pesticides over Europe

Mayer Ludovic Thierry

Current assumptions about the currently-used pesticides have led to the belief that their long-range atmospheric transport (LRAT) is unlikely. However, recent evidence of their presence in remote arctic air calls this assumption into question. To address this discrepancy, we sampled pesticides at 29 sites across Europe and the Arctic in spring 2020. Our findings identified 22 pesticides as prone to LRAT, including 15 approved for agricultural use and 7 banned in the EU. These results show the need for a revision of the current pesticide risk assessment methods in regards to their persistence and LRAT potential.

P21

Pull-down assay as a novel approach for the identification of compounds interfering with thyroid hormone signalling in complex environmental mixtures

Mikušová Petra
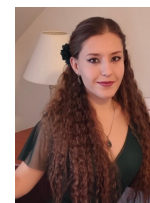
Environmental pollutant mixtures can elicit various endocrine disrupting effects, but the effect drivers are often unknown, since their identification is very challenging. Some environmental pollutants can disrupt thyroid hormon transport by plasma protein transthyretin (TTR), which can lead to neuro/developmental or metabolic disorders. Pull-down assay is a novel method we developed and optimized for the identification of TTR ligands from environmental complex mixtures and applied it to water samples. It is based on protein engineering (using plasmid-E.coli transformation), binding of TTR ligands to the TTR protein on molecular leve, identification and confirmation of the ligands through non/target HRMS analysis.

P22

Liver on fire? Exposure to PFAS and PAHs in relation to cardiometabolic health (CELSPAC-FIREexpo STUDY)

Pálešová Nina

Firefighters are occupationally exposed to polycyclic aromatic hydrocarbons (PAHs) and perfluoroalkyl substances (PFAS), which can lead to adverse health effects such as cardiometabolic syndrome. However, these relationships in firefighters are investigated very weakly. CELSPAC-FIREexpo study includes 110 firefighters and 54 non-firefighters (control group). The relationships between the exposure (6 PFAS, 6 OH-PAHs) and biomarkers of cardiometabolic health (4 liver enzymes, bilirubin, total cholesterol (CHOL), LDL-cholesterol (LDL) and triglycerides) were investigated using multiple linear regression (MLR, for individual compounds) and Bayesian weighted quantile sum regression (BWQS, for mixture of compounds). Positive associations between exposure to PFAS and PAHs mixture and BIL, CHOL and LDL were observed in BWQS model, which can result in an unfavourable cardiometabolic profile occupationally exposed firefighters.

Abstracts

P23

Adverse outcome pathway linking nuclear receptor overactivation to feeding disruption

Phan Audrey, Xuan-Anh
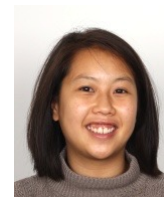
Retinoid signaling is crucial for development and homeostasis across vertebrates. Moreover, retinoid-like activities detected in Czech Republic reservoirs and for several triazole-fungicides have been associated with teratogenic effects in zebrafish larvae.

The study focuses on the development of adverse outcome pathway (AOP) leading to impairment in zebrafish early development, namely craniofacial malformation, posterior swim bladder inflation, and regulatory endpoints feeding disruption and survival. This brings together data for implementing AOP knowledge into risk assessment. Results indicate that the teratogenicity induced by retinoid disruption leads to 50% inhibition of feeding (7dpf) and ~90% mortality (14 dpf) at 1 ug/L all-trans-retinoic acid.

P24

The effect of intrapartum antibiotics prophylaxis on neonatal gut and oral bacteriome

Pivrncová Eliška

The administration of intrapartum antibiotics prophylaxis (IAP) is commonly used in cesarean section and for the prevention of early-onset Group-B-streptococci infection. Since IAP may influence the microbiome development in neonates, our pilot study aimed to characterize the gut and oral bacteriome changes between neonates grouped according to their exposure to antibiotics during the delivery and sampling time in the first week of their life. 16S rDNA sequencing revealed differences in bacterial abundance in transitional stool samples, but not in meconium samples. Moreover, IAP influenced the oral bacteriome of neonates within 48 hours after birth. However, the effect of IAP on oral bacteriome seems to be suppressed later in the first week of their life.

P25

A novel method of stress measurement based on thermodynamics Results from the CHILL-ICE II space analog mission

Ráčková Lucie

This project aimed to measure markers of stress response in analog astronauts during the 7days long space analog mission, and to validate use of prototype for Stress Entropic Load (SEL) measurement in context of cave-based space analogue mission. The SEL is a novel model for stress assessment based on thermodynamics. It quantifies the accumulation of entropy produced by specific individual as a response to given stressor or combination of stressors independently of their character. Hence, allows comparing stress across individuals and contexts objectively. CHILL-ICE 2022 was an analog mission based in 100m depth of Iceland lava tubes, because of high geological resemblance to the Moon. A crew of 3 analog astronauts were deploying, assessed its suitability for long-term settlement and conducted research…

Abstracts

P26

Study on the effects of cyanotoxins using advanced 3D in vitro liver model

Roy Chowdhury Riju

Hepatotoxic cyanobacterial toxins (cyanotoxins) chiefly, cylindrospermopsin (CYN) and microcystin-LR (MC-LR) have been implicated in the etiology of chronic liver diseases, including metabolic disorders and even promotion of liver cancer. 3D scaffold-free HepG2 spheroid cultures and collagen-based 3D HepaRG cultures (Hepoid-HepaRG) were used to study the alterations of cellular and molecular events linked to acute and chronic liver diseases. While, HepG2 spheroids served as a suitable model to study the steatogenic potential of CYN at non-cytotoxic concentrations (1µM), Hepoid-HepaRG served as a suitable model to study the toxicity effects of MC-LR at non-cytotoxic concentrations (0.1 µM).

P27

Impact of PFAS exposure on human immunity

Rudzanová Barbora

Per- and polyfluoroalkyl substances (PFASs) are emerging environmental contaminants with multiple hazardous properties including immunomodulation potency. We aimed to investigate 1) the association between PFAS exposure and immune-mediated diseases (IMDs) and 2) the expression of genes associated with PFAS exposure in a population of Czech adults (CELSPAC: Young Adults cohort). Our results contribute to the body of literature that observes the immunomodulatory effect of PFAS exposure on the level of disease prevalence and further brought new information about underlaying deregulative mechanisms.

P28

A seven-years based characterisation of aerosol light scattering properties at Central European rural site: variability and source apportionment

Schánková Lenka

Atmospheric aerosols have direct (scattering and absorption of light) and indirect (lifetime and properties of clouds) effects on the radiative forcing of Earth's climate. These effects play a crucial role in the estimation of climate models. The aim of this study is to determine the temporal variability of the optical properties measured by nephelometer TSI 3653 at a rural background site NAOK and aerosol source apportionment. The annual decreasing scattering trend and increased aerosol cooling effect were observed, suggesting a decrease in aerosol concentration and chemical composition change in 2012-2019. No specific aerosol sources were identified, supporting the background character of the station.

P29

Protein Learning for Solubility Design

Velecký Jan

Protein solubility is an attractive target in protein engineering mainly due to its relation to yields in protein production in chemical or pharmaceutical industries. However, we have a limited understanding of solubility determinants and the effects on solubility upon mutation. Furthermore, the available mutational data have mostly been scattered in the literature. We collected these data into SoluProtMutDB, making them available in a unified format and curated for the community. The collected data enables training of advanced machine learning models, such as models fusing graph representations with convolutional neural networks. We tuned such a model for protein 3D data and planned to adapt it to predict mutational effects.

P30

Transcriptomic profiling of asthma, atopic eczema and allergies and their combinations in Czech adult population

Vespalcová Hana

Asthma, atopic eczema and allergies are widespread immune-mediated diseases that often occur together. However, the molecular signature differs within the diseases and their combinations, the deregulation mechanism remains understudied. To investigate gene expression and pathway disorders in these diseases, we analyzed blood transcriptome of the adult participants from CELSPAC cohort study. We observed nearly 150 genes differentially expressed in atopic triad, 20 of them directly involved in immunological pathways. Other 400 immune-related genes were found altered across all groups. Moreover, we identified about 200 significant affected pathways associated with innate immune response, T cells or B cells in all groups. Such investigation can help to understand the disease machinery and thus improve the potential mitigation strategies.

P31

The toxic cocktail: how organochlorine chemicals disrupt lipid metabolism in testicular Leydig cells and lead to hormonal disbalance

Virmani Ishita

Exposure to real-life organochlorine chemical cocktails is suspected of contributing to male infertility. While previous studies have investigated their effects, the mechanisms behind their toxicity are yet to be elucidated. In this study, I aimed to explore the impact of a real-life cocktail of organochlorine chemicals on lipid accumulation and profile using murine Leydig Tm3 cells. I used an image-based assay and improved single-well liquid chromatography-mass spectroscopy (LC-MS) in a 96-well plate format. My results showed this cocktail caused lipid accumulation and affected various lipid species in lipid metabolism, leading to lipotoxicity and hormone disbalance. My research adds to the evidence supporting the contribution of environmental contamination by organochlorines to decreasing trends in male reproductive health.