

Researcher – Liudmila Saveleva, PhD student, Early-Stage Researcher

Home Institution – Doctoral Programme in Molecular Medicine, A.I. Virtanen Institute for Molecular Sciences, Faculty of Health Sciences, University of Eastern Finland, Kuopio, Finland

Home Group – Neurobiology of Disease research group

Team lead – A/Prof Katja Kanninen, PhD.

Host Institution – Institute of Experimental Medicine AS CR, The Czech Academy of Sciences, Prague, The Czech Republic.

Host Group – Department of Genetic Toxicology and Epigenetics

Team lead – Jan Topinka, PhD., DSc.

Project title – Targeting the Adverse Effects of Air pollution on Brain Health

TRAINING STAY REPORT

Background:

In May 2021 I was awarded with the NENS exchange grant for a training stay at the Czech Academy of Sciences, The Czech Republic. The grant was intended to cover my training stay during 2-months visit that planned to take place 01.10.21-01.12.21. Because of the COVID pandemic I had to postpone my visit until both me and all members of a host research group were fully vaccinated. Therefore, my research visit took place on 06.12.2021-05.02.2022. During the visit, I worked closely with Pavel Rossner and Jan Topinka research groups. Dr. Rossner is a Head of the Department of Nanotoxicology and Molecular Epidemiology, and Dr. Topinka is a Head of the Department of Genetic Toxicology and Epigenetics in the Institute of Experimental Medicine AS CR, The Czech Academy of Sciences. During my visit, both research groups were working closely together on a project studying toxicological effects of pollutants exposures, which fully corresponds to my PhD thesis topic, but involves different exposure models and focuses on other organs than brain. I received an extensive methodological training in miRNA, mRNA and DNA isolation, miRNA and mRNA libraries preparation for sequencing and quality controls from the experts in the field. I learnt methods that I never used before and got familiar with the topics, subject and methods of molecular epidemiology and genetic toxicology.

Methods:

Host groups had previously established expertise in transcriptomics approaches in pollutant exposed human and mouse samples, which are not available at my home lab. During my visit, I received a hands-on wet lab training in how to identify and validate biomarkers for air pollutant exposure at the level of DNA, RNA, miRNA. I mastered miRNA, mRNA and DNA isolation from human and mouse samples exposed to different pollutants and toxins. I learnt how to prepare mRNA libraries for Next Generation Sequencing. I learnt how to prepare small RNA libraries from total RNA. The method used in Topinka's group allows detection of not only miRNAs, but also other small RNAs, including piRNAs. I performed quality controls for isolated miRNA, mRNA and DNA. I learnt how to validate prepared libraries for sequencing with Fragment Analyser and Qubit instrument. I didn't get a chance to master analysis of RNA sequencing data as I was expected. However, we will continue our collaboration with Dr. Topinka's group and continue with analysis of sequencing data online since this method does not require my physical presence.

Networking:

I was happy to join two leading in the field research groups during my stay. This research visit provided me a great opportunity to get expertise in new methods as well as in the different fields of science. Moreover, I had a chance to present projects that I work on for my PhD thesis during the seminar in the host group. And eventually we decided to start a new collaborative project together which I hope will result in a co-authored paper in the future. I really enjoyed the visit and enthusiastic environment in the host groups. I am hoping to continue with our fruitful collaboration in future.

Implementation of techniques acquired during training:

I learnt the best practices of miRNA, RNA, DNA isolation from mouse and human samples that I am implementing in my home lab right after my arrival. I received an extensive methodological training in

preparation of miRNA and mRNA libraries and their quality controls for sequencing. These methods were not previously used in my research group and now I will not only use it for my PhD project, but I will also train other members of my research group. Currently, our research group doesn't have an expertise in the whole transcriptome and miRNA expression analysis. After my visit, I am able to provide training to other researchers in at the University of Eastern Finland and I also started to integrate these methods to my PhD project. I am implementing acquired techniques in both my projects and projects of other PhD students in our group. The acquired knowledge is also helping me with writing grant applications since now I know the best practices in the field.

Professional development:

Dr.Topinka and Dr. Rossner groups have a unique experience in transcriptomics and epigenetics that perfectly matched my needs to move to the next level in my PhD. Hands-on training in these groups that work in toxicogenomics and environmental science for decades gave an incredible boost to my expertise in the field that I was not familiar before and provided me a lot of insights. NENS stipend allowed me to gain unique expertise that is impossible to obtain at my home institution. Since my highly multidisciplinary PhD study requires multidisciplinary approaches and expertise it is impossible to evolve without international and diverse collaborations. The outstanding experience of host groups together with the exciting perspective of my project, reflects exactly the brilliant environment that will enable me to give a significant contribution to the neuroscience field. This internship helped me to acquire new knowledge, learn new techniques, establish promising collaboration, discover new fields of research and potential place for my postdoctoral career.

Acknowledgements:

I would like to thank the NENS committee for the provided support. Also, I want to thank the host lab for providing me such a great training and friendly stay in so challenging times. I want to encourage everyone to apply for this amazing opportunity that allows you to achieve new skills and experiences. I am incredibly grateful to NENS committee that made my visit happen!

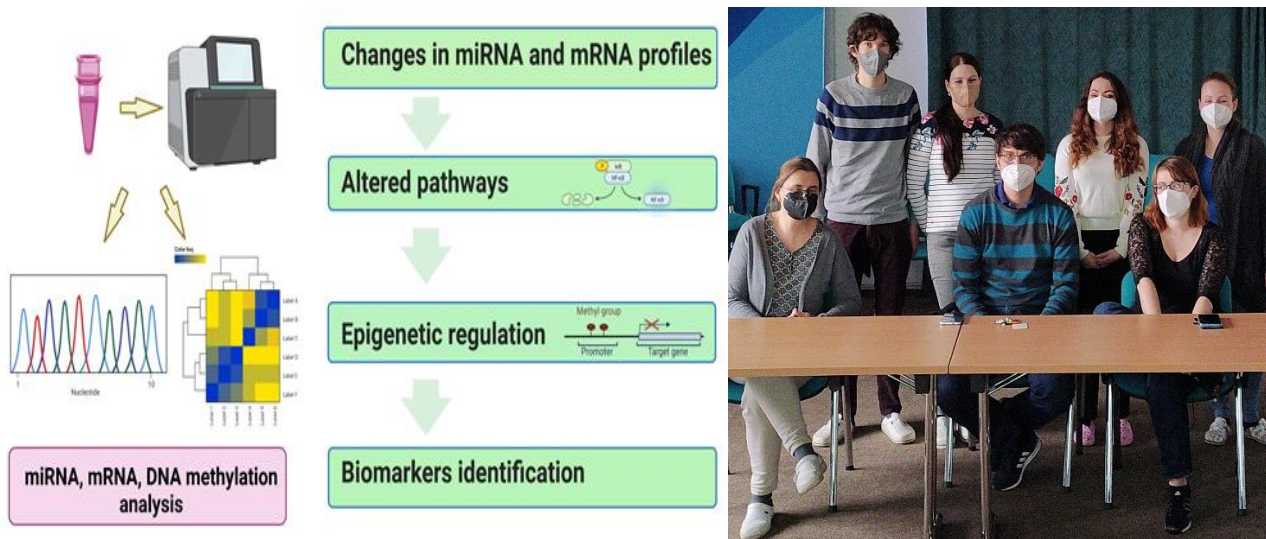


Fig. Left – summary of scientific methods used during the training.
Right – part of the host team due to the COVID regulations for meetings.