

*HORIZON-JU-IHI-2022-03-01: Screening platform and biomarkers for prediction and prevention of diseases of unmet public health need*

### **Metabolomics and Lipidomics: early diagnosis and personalised treatment**

Our Analytical section focuses on the coupling of separation techniques and mass spectrometry with major application in metabolomics and lipidomics. We have more than 15 years of experience in LC/MS and SFC/MS analysis of lipids and metabolites in a wide range of animal and biological samples from animal models or clinical studies. In addition, we provide statistical analysis of the data. **We use our methods in various areas of medicine to the study of disease etiology, search for biomarkers, early diagnostics or personalised treatment.** We have experience with clinical studies of various disorders such as schizophrenia, breast cancer, lung cancer and kidney cancer.

#### **Potential contribution to the project:**

- LC/MS and SFC/MS metabolomics and lipidomics in clinical studies or animal models
- biomarker discovery using our (un)targeted metabolomic and lipidomic methods
- early diagnosis and personalised treatment of disorders based on metabolite/lipid screening

#### **Methods available:**

*samples: clinical, animal models, plasma, healthy/cancer tissues, brain/kidney/breast/lung tissue, placenta, etc.*

1. untargeted LC/MS metabolomic analysis of polar metabolites including wide range of neurotransmitters
2. untargeted SFC/MS lipidomic analysis of a wide range of middle-polar and nonpolar lipids
3. targeted LC(SFC)/MS analysis of endocannabinoids, gangliosides and di-/mono-acylglycerol enantiomers
4. multivariate statistical analysis of data – supervised (OPLS) and unsupervised (PCA) evaluation of large clinical cohorts, determination of up-regulated and down-regulated metabolites

#### **Previous metabolomics/lipidomics projects:**

- Monitoring of neurotransmitters and other metabolites in schizophrenia animal model and clinical samples (in cooperation with National Institute of Mental Health).
- Study of physiological function of placenta (Charles University, University Hospital in Hradec Králové).
- Lipidomic analysis in lung, breast and kidney cancer clinical studies (Pardubice Hospital, University Hospital of Olomouc).

#### **Examples of published work:**

1. M. Lísa, T. Jiráňková, Highly repeatable and selective ultrahigh-performance supercritical fluid chromatography – Mass spectrometry interclass separation in lipidomic studies, *Microchemical Journal*, 178 (2022) 107376. <https://doi.org/10.1016/j.microc.2022.107376>
2. E. Cífková, M. Lísa, R. Hrstka, D. Vrána, J. Gatěk, B. Melichar, M. Holčápek, Correlation of lipidomic composition of cell lines and tissues of breast cancer patients using hydrophilic interaction liquid chromatography – electrospray ionization mass spectrometry and multivariate data analysis, *Rapid Commun. Mass Spectrom.* 31 (2017) 253-263. <https://doi.org/10.1002/rcm.7791>
3. M. Lísa\*, E. Cífková, M. Khalikova, M. Ovčačíková, M. Holčápek, Lipidomic Analysis of Biological Samples: Comparison of Liquid Chromatography, Supercritical Fluid Chromatography and Direct Infusion Mass Spectrometry Methods, *J. Chromatogr. A* 1525 (2017) 96-108. <https://doi.org/10.1016/j.chroma.2017.10.022>

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