

Metabolomics unit

Metabolomics is broadly defined as qualitative and quantitative analysis of small (up to 1,500 Da) chemical molecules. Since it was observed that multiple physiological (growth, development, recovery, diet, physical activity, etc.), pathological (diseases, poisoning, damage, etc.), and environmental (abiotic stresses, inter-species interaction, etc.) conditions are associated with alterations in metabolites, metabolomics rapidly became a popular approach in biological studies.

In respect to research focus, metabolomics can be conditionally divided to targeted and untargeted approaches. Targeted approach aims to precisely identify and quantify pre-selected compounds, while untargeted approach mostly focuses on relative abundances of a broad set of known and unknown metabolites. A proper selection among these approaches or complementary use of both is an important step in metabolomics experiments.

Technology-wise, metabolomics can be performed by nuclear magnetic resonance (NMR) spectroscopy and mass spectrometry (MS). Currently, more than 85% of metabolomics studies is performed using combination of MS with chromatographical methods (gas - GC or liquid - LC).

The metabolomics unit at the Ilse Katz Institute for Nanoscale Science & Technology is equipped with three high-resolution (HR) MS instruments (from Thermo scientific) with Electron Spray Ionization (ESI), coupled with Ultra Performance Liquid Chromatography (UPLC) systems (from Waters). In case of mass-spectrometry, "high resolution" means the ability of the instrument to detect an exact molecular weight of compounds. Chromatographic separation ahead of MS detection is used to identify additional parameters of the compound, such as retention time (RT), and to reduce a complexity of analyte. Altogether, HR MS coupled with LC provides a precise and sensitive platform for the analysis of hundreds known metabolites.

The Unit services include:

- Consultation in experiment design
- Assistance with sample preparation method development
- UPLC-MS method development and optimization
- Data acquisition
- Basic and advanced data analysis
- Down-stream support in preparation to publications
- Training

Instruments:

Thermo Q-Exactive and Thermo Q-Exactive Plus



Ideal for both Data Independent Analysis (DIA) and Parallel Reaction monitoring (PRM). Resolving power up to 140,000 Full Width at Half Maximum (FWHM).

Thermo Q-Orbitrap Exploris 240



Next level of precision and sensitivity in small molecules analysis in DIA and PRM modes. Resolve ions with up to 240,000 FWHM resolution with 1ppm mass accuracy.

Waters ACQUITY UPLC I-Class PLUS System



High precision binary pump with adaptable sample manager for vials and plates and large range of injection volume