Selected research topics in Biomedical Engineering: Novel Phenotyping and Diagnostic Tools

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Metabophenotyping in drug discovery research

Dr. Juan Zhang

Novartis, Switzerland

Abstract

Metabolism plays a central role in our health and diseases. Not only metabolic disorders, but also cancer, inflammatory, degenerative, and autoimmune diseases have been associated with abnormal metabolism. For example, patients with autoimmune diseases such as systemic lupus erythematosus or multiple sclerosis often also present with dysregulation of metabolic pathways including oxidative stress, energy and/or cholesterol metabolism. How the metabolic system on both cellular and systemic level responses and adapts to internal and external stimuli, shapes its metabotype. Investigating the role of metabolism in biological processes and identify the metabotypes are essential for understanding disease mechanism and developing therapeutic intervention.

There are different methodologies to characterize and investigate metabolism. One of them is metabolomics, which combines molecular analysis technologies, such as mass spectrometry or nuclear magnetic resonance spectroscopy, with single or multi-variant statistical data analysis.

In this presentation, I will give a couple of examples on how metabolomics technologies can be applied in early phase drug discovery to investigate the role of pathway specific biomarkers and understand their links to diseases.

Curriculum:

Juan Zhang received a Diploma in chemistry from the Eidgenössische Technische Hochschule Zürich (ETHZ). This was followed by a doctoral research on the mechanism of matrix-assisted laser desorption/ionization mass spectrometry (MALDI-MS) in the group of Prof. Renato Zenobi at ETHZ. She then went to Novartis Institutes for Biomedical Research (NIBR) in Basel as a presidential postdoc fellow and developed unbiased metabolomics methods using liquid chromatography coupled with a Fourier transform ion cyclotron resonance mass spectrometer (LC-FTICR MS). Since 2005, she works as an investigator in the department of Analytical Sciences and Imagine, where she leads an analytical lab for metabolomics. Her lab's activities are focused on applying targeted metabolite profiling technologies to support drug discovery researches.