Chemical Tagging to Enhance the Metabolomic Toolbox: From Islets to New Metabolites

Dr. James Edwards

Professor of Chemistry at Saint Louis University in St Louis, Missouri.



Chemistry Seminar on metabolomics

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Abstract: Advancement of LC-MS based metabolomics is hindered by low throughput, variable analyte sensitivity, and identification certainty. The diverse properties of metabolites including structure, functional group, and charge state pose analytical challenges. Chemical derivatization can be used to leverage these challenges by attaching a readily ionizable moiety to each metabolite which can be used to increase sensitivity and improve fragmentation and MS/MS identification. Multifunctional chemical derivatization allows wide coverage of metabolite classes providing a broad view of metabolic pathway changes. Chemical tagging allows for investigation into low cell number populations where metabolism drives functional output.

These techniques coupled with stable isotope labeling can provide structural information for annotation of unique metabolites in biological systems. Discovery and identification of a new endogenous metabolite is typically hindered by requirements of large sample volumes and multistage purifications to guide synthesis of the standard. Presented here is a platform that uses chemical tagging and tandem mass spectrometry to determine structure, direct synthesis, and confirm identity. Three new homocysteine metabolites are reported: N-succinyl homocysteine, 2-Methyl-1,3-thiazinane-4-carboxylic acid (MTCA), and homolanthinone.

About the speaker: James Edwards is a Professor of Chemistry at Saint Louis University in St Louis, Missouri. Dr. Edwards received his B.A. and MS degrees in chemistry at Saint Louis University investigating ATP release from red blood cells. He obtained his PhD degree in analytical chemistry from the University of Michigan in Ann Arbor working on capillary-based LC-MS metabolomic methods. His post-doctoral training was at the Juvenile Diabetes Research Foundation Center for Diabetic Complications. James was previously a professor at The University of Maryland Biotechnology Institute in Rockville, Maryland. In 2012, he moved to Saint Louis University where his lab investigates new metabolomic technologies to understand the biochemical perturbations in diabetes, immunology, and toxicology.