Data Independent Acquisition: Expanding the Scope of DIA Strategies for Quantitative Mass Spectrometry (Data Independent Acquisition Interest Group)

Tuesday June 4th, 2019; 5:45 – 7:00 PM

American Society of Mass Spectrometry (ASMS) 2020 Annual Meeting

I. **Organizers:**

a. Hannes Röst, PhD
Assistant Professor
Donnelly Centre for Cellular and Biomolecular Research
University of Toronto

b. Birgit Schilling, PhD
Assistant Professor
Director of the Mass Spectrometry Core
Buck Institute for Research on Aging

II. **Invited Panelists:**

a. Florian Meier, PhD
Postdoctoral Research Fellow
Department of Proteomics and Signal Transduction
Max Planck Institute of Biochemistry

b. Andrea Matlock, PhD
Project Scientist
Department of Medicine
Cedars-Sinai Medical Center

c. Stefan Tenzer, PhD
University Professor
Core Facility for Mass Spectrometry
Department of Immunology
Universitätsmedizin der Johannes Gutenberg-Universität

d. Brian Searle, PhD
Translational Research Fellow
Institute for Systems Biology

e. Eduard Sabido, PhD
Head of CRG/UPF Proteomics Unit
Proteomics Core Facility
Centre for Genomic Regulation (CRG)

f. Lukas Reiter, PhD
Chief Technology Officer
Biognosys AG

III. Introduction and Overview

a. The data-independent acquisition (DIA) workshop was organized and hosted by Drs. Birgit Schilling (Buck Institute) and Hannes Röst (University of Toronto) with an open panel composed of many experts in the field of proteomics. The panelists and their affiliations are listed in Section II, and these expert scientists were chosen such that at least one panelist was an expert in the topics of discussion. The workshop focused on data-independent acquisition (DIA) and its value over other proteomic quantification methods available, including tandem-mass tag (TMT) labeling, data-dependent acquisition (DDA), and label free quantification (LFQ) among other methods. The panel was asked questions by both the organizers and the audience throughout. The planned topics discussed were: DIA: opportunities and challenges, what prevents scientists from using DIA over DDA, ion mobility, library building, clinical uses of DIA, DIA vs. DDA, and how to switch to DIA in core facilities. Each of these discussions will have details outlined in Section IV.

IV. Panel Topics of Discussion

a. DIA: Opportunities and Challenges
    i. Large group discussion focused on when to use DIA
    ii. Dr. Searle: DIA with posttranslational modification (PTM) research

b. What Prevents Scientists from using DIA?
    i. Initial method setup and development can be daunting
    ii. Lack available libraries

c. Ion Mobility
    i. Dr. Meier focused on how to use DIA on large scale projects using ion mobility
    ii. Combining MS1 and MS2 scans
    iii. Dr. Reiter discussed deep learning tools are being developed by Biognosys and others

d. Spectral Library Building
    i. Which libraries should you use?
    ii. Using DIA and searching DIA to build libraries directly from DIA without DDA
    iii. Dr. Searle discussed the use of chromatographic libraries
    iv. ISB as centralized repository for spectral libraries

e. Clinical Uses of DIA
    i. Primary experts: Andrea Matlock and Lukas Reiter
    ii. Dr. Matlock focused on how MS, specifically DIA, can be used in the clinic
        1. FDA approval for clinical DIA work is more difficult versus for SRM and PRM, which is slightly easier to obtain approval for from the FDA (as has been demonstrated for existing assays)
    iii. Dr. Reiter focused on utilization of MS, specifically DIA, in the clinic for pharmacologic studies and implications
        1. Dr. Reiter has done extensive work using DIA on cerebral spinal fluid (CSF) and plasma

f. Data-independent Acquisition (DIA) vs. Data-dependent Acquisition (DDA)
    i. Dr. Meier discussed how to improve DIA workflows and consequences
        1. Important to balance cycle time (for example for ion mobility with DIA), sensitivity and coverage when planning a DIA experiment

g. Using DIA in a Core Facility

i. Primary experts: Eduard Sabido and Stefan Tenzer
ii. When to use DIA?
    1. Potentially increased work load in the core for DIA workflows when no libraries are available ?
    2. Acquisition costs ?