

IPD Project Details

Project ID: IPD8252

Project Title: An Integrated Quantitative Proteomics Workflow for Biomarker Discovery and Validation in Plasma

Description: Blood plasma is one of the most widely used samples for biomarker discovery research as well as clinical investigations for diagnostic and therapeutic purposes. However, the plasma proteome is extremely complex due to its wide dynamic range of protein concentrations and the presence of high-abundance proteins. Here we are describing an optimized integrated quantitative proteomics pipeline combining the label-free and multiplexed-labeling-based (Isobaric tags for relative and absolute quantitation) proteome profiling methods for biomarker discovery, followed by the targeted approaches for validation of the identified potential marker proteins. In this workflow, the targeted quantitation of proteins is carried out by multiple-reaction monitoring (MRM) and parallel-reaction monitoring (PRM) mass spectrometry. Thus, our approach enables both unbiased screenings of biomarkers and their subsequent selective validation in human plasma. The overall procedure takes only 1–2 days to complete including the time for data acquisition (excluding database searching). This protocol is quick, flexible and eliminates the need for a separate immunoassay-based validation workflow in blood biomarker investigations.

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Sample Preparation: In this integrated quantitative proteomics pipeline, three different biological pool of plasma samples were analyzed for obtaining a comprehensive proteome profile and subsequent validation of a few selective proteins. Each of the three plasma pools (named as samples A, B, and C) was a uniform mixture of ten different individual plasma samples.

Peptide Separation: In order to perform the targeted proteomics analyses, a pool of 21 heavy labeled synthetic peptides were spiked into the plasma samples at a different ratio. Global quantitative proteomics was performed using both label-free and label-based (iTRAQ) quantitation approaches, while the targeted proteomics was carried out using MRM and PRM-based MS.

Protein Characterization: Global quantitative proteomics data were analyzed using Proteome Discoverer, while the targeted proteomics data were analyzed using Skyline.

Experiment Type: Shotgun proteomics

Species: Homo sapiens - 9606

Tissue: Blood plasma (bto:0000131)

Cell Type:

Disease: Unknown

Instrument Details: Orbitrap Fusion (MS:1002416)

Protein Modifications: iodoacetamide derivatized residue

PubMed ID: