# IPD Project Details

**Project ID:** IPD2550

**Project Title:** Mycobacterial strain-specific temporal modulations of newly synthesized macrophage secretome

**Description:** THP-1 macrophages were infected with four strains of Mycobacterium tuberculosis to study the temporal dynamics of newly synthesized proteins in the secretome. Temporal snapshots of secretome reflect the macrophage response to pathogenicity which in combination with intracellular events, completes the disease picture. However, such studies are compromised by limitations of quantitative proteomics. Metabolic labeling by SILAC allows a 3-plex experiment while isobaric chemical labeling by iTRAQ/TMT allows up to 8 to 10-plex respectively. This makes studying temporal proteome dynamics an intangible and elusive proposition. We have developed a new variant of hyperplexing method, combining triplex SILAC with 6-plex iTRAQ to achieve 18-plex quantitation in a single MS run. THP-1 macrophages were infected with H37Ra, H37Rv, BND433 and JAL2287 and the newly synthesized secreted host proteins were studied over six temporal frame still 30 hours post infection, at a difference of 4 hours each. For quantitation, the strains were encoded with two sets of triple SILAC- H37Ra & H37Rv in one and BND433 & JAL2287 in another with a control in each. These sets were then iTRAQ labeled to encode for temporal profiles across six time points in 6-plex iTRAQ. Effectively a 36-plex design with 4 replicates of each set, these experiments were completed within few days on the mass spectrometer. Using MaxQuant and in house developed tools and pipelines, we have analysed the data to map the temporal and strain specific dynamics of newly synthesized proteins in host. Hyperplexing enables large scale spatio-temporal systems biology studies where large number of samples can be processed simultaneously and in quantitative manner.

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**Sample Preparation:** THP-1 cells were differentiated in the presence of PMA, as described earlier (Jamwal et al, Sci. Reports, 2013). Cells were either left uninfected or infected with single cell suspension cultures of mycobacterial strains (H37Ra and H37Rv; BND433 and JAL2287) at MOI of 10 per cell. At required time-points, cells were depleted, for 1 hour, of methionine (to label with AHA to pull out newly synthesized

proteins), lysine and arginine (used for SILAC labeling) and incubated in with 10% dialyzed FBS (GIBCO). Thereafter, depletion media was replaced with unlabeled media for the uninfected cells (Lys?, Arg?), medium labeled media for H37Ra and BND433 infected cells (Lys6, Arg6) and heavy labeled media for cells infected with H37Rv and JAL2287 (Lys8, Arg10). 0.1mM L-Azidohomoalanine (L-AHA) (AnaSpec, Inc) was supplemented to all variants of media. Media excluding cells were collected, pooled and concentrated using Amicon Ultra Centrifugal filters (3-kDa cutoff) at 4?C and 6000rpm and frozen at -80?C.

**Peptide Separation:** Newly synthesized proteins from concentrated media were enriched using Click-iT Protein Enrichment kit (Invitrogen C10416) as per manufacturer's instructions. All samples were analyzed by reverse-phase high-pressure liquid chromatography electrospray ionization tandem mass spectrometry (RP-HPLC-ESI-MS/MS) using a NanoLC-Ultra 1D plus (Eksigent; Dublin, CA) and nanoFlex cHiPLC system (Eksigent) which is directly connected to an ABSCIEX 5600 Triple-TOF (AB SCIEX; Concord, Canada) mass spectrometer.

**Protein Characterization:** The wiff files from ABSCIEX 5600 were searched using MaxQuant (1.5.0.30) against Uniprot human database with cRAP sequences and their corresponding reversed sequences. The parameters for search were as follows - triple SILAC on Lysine and Arginine with mass of iTRAQ added to Lysine labels, fixed modifications used were- carbamidomethylation at cysteine & iTRAQ at N-term; variable modifications were- methionine oxidation, BONCAT and deamidation at NQ residues. The wiff files were converted to mgf files using msconvert and iTRAQ labels were quantified using QuantWizIQ developed in-house. Using MaxQuant and in house developed tools and pipelines (QuantWizIQ and HyperQuant), we have mapped the temporal and strain specific dynamics of newly synthesized proteins in host.

**Experiment Type:** Shotgun proteomics

**Species:** Data in species_details  No Data

**Tissue:** Data in tissue_details  No Data

**Cell Type:** Data in cell_details  No Data

**Disease:** Data in disease_details  No Data

**Instrument Details:** Data in instrument_details  Data in instrument_details

**Protein Modifications:** monohydroxylated residue, deaminated residue, 6x(13)C labeled residue, iodoacetamide derivatized residue

**PubMed ID:**