

Multi-omics Characterization of the Host Response to COVID- 19

December 2020

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Report

This project is a multi-disciplinary collaboration between investigators at PNNL with expertise in mass spectrometry (MS)-based omics technology development, omics measurement methods development and application, statistics, machine learning and integration of disparate datasets for a systems-level understanding, and expertise in pathogenic coronaviruses, and investigators at the University of Wisconsin-Madison (UW-Madison) with expertise in pathogenic respiratory viruses (e.g. influenza). The goal of this project is to obtain a comprehensive picture of the human host factors critical for the outcome of SARS-CoV-2 infection. We will generate broad untargeted multi-omics profiles using both state-of-the-art and novel instrumentation and approaches to enable the identification of the molecular mechanisms and host response pathways that impact human COVID-19 outcomes. We anticipate these results will lead to the generation of biomarker panels that are predictive of disease outcomes and mechanistic hypotheses that can be further interrogated in future studies and will provide the basis for vaccine or therapeutic development. To do so, we are obtaining and analyzing blood samples from COVID-19 patients with a range of disease outcomes that were treated at the Center Hospital of the National Center for Global Health and Medicine in Tokyo, Japan and other collaborating hospitals in our network. Specifically, this project will fund proteomics and metabolomics analyses of clinical COVID samples, machine learning-based integration of the data, and pathway-based interpretation of the data.

This project was funded in June 2020. In the time span of June to September 2020, the project team developed an analytically and statistically robust analysis plan and made various preparations to facilitate sample receipt from our UW-Madison collaborators. This included blocking and randomization of sample prep orders, ordering of reagents and reference materials, and shipping of materials needed for preparation of the samples under BSL3 conditions to our collaborators at UW-Madison.

As of FY21, this project has been picked up via a sponsor, the Naval Medical Research Center, which will cover the remainder of the proposed scope of work.

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