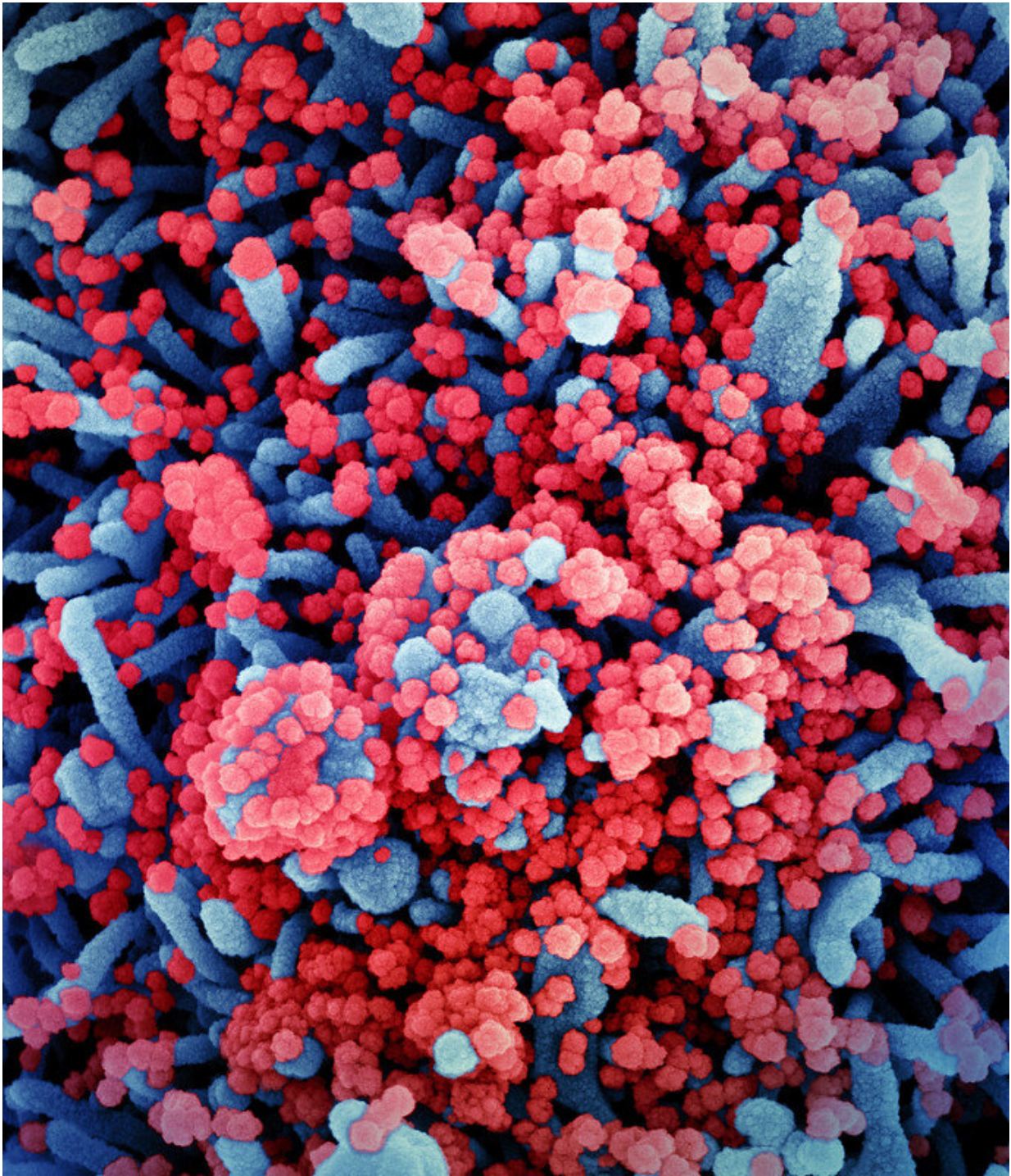# Metabolite signature of COVID-19 reveals multi-organ effects

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Colorized scanning electron micrograph of a cell (blue) heavily infected with SARS-CoV-2 virus particles (red), isolated from a patient sample. Image captured at the NIAID Integrated Research Facility (IRF) in Fort Detrick, Maryland. Credit: NIAID

SARS-CoV-2, the virus responsible for COVID-19, can cause a wide range of symptoms, from none at all to severe respiratory stress, multi-organ failure and death. The virus notably targets the lungs, but many patients also experience non-respiratory symptoms. Now, researchers reporting in ACS' *Journal of Proteome Research* compared lipoproteins and metabolites in the blood of COVID-19 patients and healthy subjects, revealing signs of multi-organ damage in patients that could someday help diagnose and treat COVID-19.

Current diagnostic tests for COVID-19 rely on the detection of viral RNA or antibodies against the virus. Both types of tests are prone to false-negative results, as well as having other limitations. Another possible way of detecting SARS-CoV-2 infection could involve analyzing metabolic changes the virus causes in an infected person. Jeremy Nicholson, Elaine Holmes and colleagues wanted to analyze the systemic effects of the disease and determine whether there is a general metabolic signature of COVID-19.

The researchers collected blood samples from 17 patients who tested positive for COVID-19 with current assays and from 25 healthy age-, sex- and body mass index-matched controls who were proven negative for current or prior SARS-CoV-2 infection with an antibody test. Then, the team analyzed the plasma lipoprotein, metabolite and amino acid levels in blood plasma with nuclear magnetic resonance spectroscopy and liquid chromatography-mass spectrometry.

Through multivariate statistical analyses that detected differences between patients and controls, the researchers revealed a metabolic signature of SARS-CoV-2 infection involving signs of acute inflammation, liver dysfunction, diabetes and cardiovascular disease risk. The team is now validating the data in a much larger group of

patients. In addition to possibly being used to develop a metabolite-based diagnostic test, these results suggest that recovered COVID-19 patients should be evaluated for increased risks for other conditions, the researchers say.

More information: Ruey Leng Loo et al. Quantitative In-Vitro Diagnostic NMR Spectroscopy for Lipoprotein and Metabolite Measurements in Plasma and Serum: Recommendations for Analytical Artefact Minimization with Special Reference to COVID-19/SARS-CoV-2 Samples, *Journal of Proteome Research* (2020). DOI: 10.1021/acs.jproteome.0c00537

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