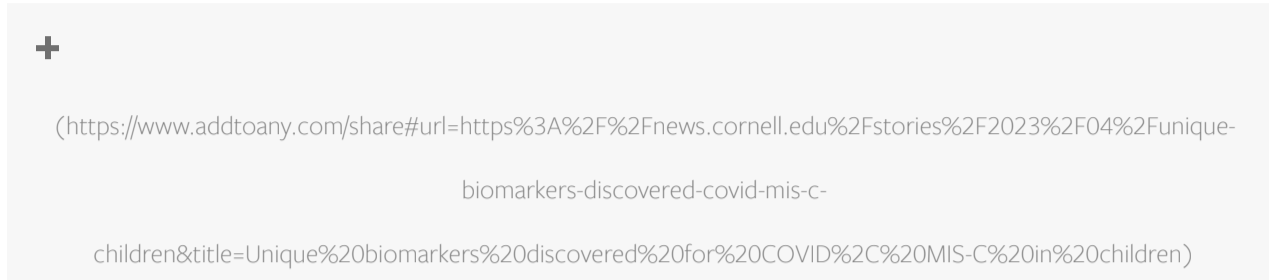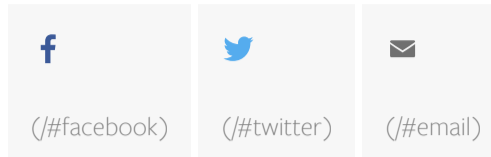# Unique biomarkers discovered for COVID, MIS-C in children

By Syl Kacapyr, Cornell Engineering

April 25, 2023

Researchers have identified blood biomarkers that could help pediatricians quickly diagnose in children severe cases of COVID-19 as well as multisystem inflammatory syndrome, also known as MIS-C, a poorly understood disease that emerged during the pandemic.

The research, co-led by Cornell and the University of California, San Francisco (UCSF), used next-generation sequencing technology to characterize severe cases of COVID-19 and MIS-C, which is often difficult to diagnose due to its generic, inflammatory symptoms. The disease can cause swelling in the heart, lungs, brain, eyes and other organs, usually requiring hospitalization and intensive treatment.

The sequencing, detailed April 21 in the journal **Cell Reports Medicine** (https://www.cell.com/cell-reports-medicine/fulltext/S2666-3791(23)00148-9), profiled blood samples from 237 patients at children's hospitals for cell-free nucleic acids – DNA and RNA molecules in blood that can be used as a proxy for organ health – and uncovered distinct signatures of cell injury for both diseases.

"In MIS-C we found elevated levels of cell-free RNA from neuronal cells, endothelial cells that compose arteries and veins, and a specific type of immune cell – neutrophils," said Conor Loy, first author of the study and doctoral student in the lab of senior author **Iwijn De Vlaminck** (https://www.bme.cornell.edu/faculty-directory/iwijn-de-vlaminck), associate professor of biomedical engineering. "This indicates that these cells are damaged in patients with MIS-C, but further validation is needed."

The technique was paired with whole blood RNA profiling, providing a complementary systems-level view of immune responses to the tissue damage in COVID-19 and MIS-C patients.

"Our hope is that these findings provide further insight into MIS-C and can lead to the development of tools to help clinicians diagnosis patients quicker," said Loy. He added that the diagnosis of MIS-C currently relies on clinical symptoms, but not all patients exhibit clear signs, and in some cases, the disease has been misdiagnosed as Kawasaki disease.

The study's other co-lead authors are Dr. Charles Chiu, director of the UCSF-Abbot Viral Diagnostics and Discovery Center, UCSF postdoctoral scholar Alicia Sotmayor-Gonzalez and UCSF bioinformatics programmer Venice Servellita. Other co-authors include researchers from the Children's National Hospital, UCSF Benioff Children's Hospital, Emory University and Children's Healthcare of Atlanta.

The research was funded by a grant from the National Institutes of Health's National Institute of Child Health and Human Development as part of a national effort to develop approaches to identify children at high risk of developing MIS-C. **Initial research** (https://news.cornell.edu/stories/2021/01/covid-19-research-seed-grants-yielding-rapid-results) was funded by a Rapid Research Response SARS-CoV-2 Seed Grant from Cornell's Office of the Vice Provost for Research and Innovation.

The research group has been awarded a second phase of funding from the National Institutes of Health to continue developing diagnostic tests.

Syl Kacapyr is associate director of marketing and communications for the College of Engineering.

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