Mass Cytometry in COVID-19 Research
As of April 1, 2021

Publications, Preprints and Clinical Research Trials

Mass cytometry, powered by CyTOF® technology, is being used in dozens of labs around the world as well as several large consortia to understand the immune response to COVID-19 infection and provide critical information for the development and design of therapies and vaccines. The following is a current list of publications and clinical research trials where CyTOF is being utilized.

### Publications

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Reviews and Commentary


Preprints


Clinical Research Trials

1 Immunophenotyping Assessment in a COVID-19 Cohort (IMPACC) (NCT04378777)
   Sponsor: National Institute of Allergy and Infectious Disease (NIAID); 12 participating institutions in North America
   “This surveillance study will collect detailed clinical, laboratory, and radiographic data in coordination with biologic sampling of blood and respiratory secretions and viral shedding in nasal secretions in order to identify immunophenotypic and genomic features of COVID-19-related susceptibility and/or progression. The aim: for the results obtained from this study to assist in generating hypotheses for effective host-directed therapeutic interventions, to help to prioritize proposals for such interventions, and/or optimize timing for administration of host-response directed therapeutics.”

2 In-Depth Immunological Investigation of COVID-19. (COntAGIouS) (NCT04327570)
   Sponsor: Universitaire Ziekenhuizen Leuven
   “The COntAGIouS trial (COvid-19 Advanced Genetic and Immunologic Sampling; an in-depth characterization of the dynamic host immune response to coronavirus SARS-CoV-2) proposes a transdisciplinary approach to identify host factors resulting in hyper-susceptibility to SARS-CoV-2 infection, which is urgently needed for directed medical interventions.
   “The overall aim of this prospective study is to provide an in-depth characterization of clinical and immunological features of patients hospitalized in UZ Leuven because of SARS-CoV-2 infection. Assessed characteristics will be compared between severe and non-severe COVID-19 patients, and between COVID-19.”

3 Prospective Natural History Study of Smoking, Immune Cell Profiles, Epigenetics and COVID-19 (NCT04403386)
   Sponsor: National Institute of Environmental Health Sciences (NIEHS)
   “This study is a prospective, longitudinal, observational, single-center, exploratory study to collect samples and data that will enable explorations of the interaction between smoking, immune system characteristics and Coronavirus Disease 2019 (COVID-19). This study will collect baseline samples and data prior to COVID-19 infection required to explore these interactions prospectively. Early evidence in the COVID-19 pandemic suggests that smokers have higher risk for morbidity and mortality associated with COVID-19 infection. We have identified smoking-associated altered epigenetics, transcription and changes in immune cell profiles. We propose that the immune system senescence associated with prior smoking is a susceptibility factor in COVID-19 morbidity.”
4  **Mesenchymal Stem Cell for Acute Respiratory Distress Syndrome Due for COVID-19 (COVID-19)**  
(NCT04416139)  
**Sponsor:** Instituto Nacional de Ciencias Medicas y Nutricion Salvador Zubiran  
“Acute Respiratory Distress Syndrome (ARDS) is the main cause of death from COVID-19. One of the main mechanisms for ARDS is the violent storm of cytokines and chemokines, which cause uncontrolled fatal systemic inflammation by the immune system on the body, with additional multiple organ failure. ...  
“The plasticity of Mesenchymal Stem Cells (MSC) regulates inflammation and immunity. ... IV application of allogeneic MSC has been shown to control the inflammatory response in various diseases, such as the graft-versus-host reaction and the ARDS caused by H5N1.  
“The objective of this study is to describe the clinical changes secondary to IV administration of allogeneic MSC, in patients with bilateral COVID-19 pneumonia complicated by severe ARDS ...”

5  **Systematic Assessment of SARS-CoV-2 Neurotropic Capacity in Modestly and Critically Ill Patients, and Patients Who Died From COVID-19 (NCT04472013)**  
**Sponsor:** University Hospital, Basel, Switzerland  
“This study is to analyze the microglia reaction or direct neurotropic effects of CNS COVID-19 in pathogenesis and brain stem dysfunction in critically ill patients. ...  
“Primary endpoints of this project are the multidimensional integration of the analysis from the procedures described above and assessment of the correlation between the gained clinical data (MRI, mental/neurological state), the body fluid proteomic and mass-cytometric analysis (CSF and Plasma proteomics, peripheral blood mass cytometry) and the CODEX analysis of defined brain regions on autopsy specimens.”

6  **Efficacy and Safety of Corticosteroids in COVID-19 (NCT04273321)**  
**Sponsor:** Beijing Chao Yang Hospital  
“There is still controversy about the effective of glucocorticoids for the treatment of novel coronavirus pneumonia. This is a prospective randomized controlled trial. The aim is to explore the effectiveness and safety of glucocorticoids in the treatment of novel coronavirus pneumonia.”

7  **COVID-19: Pediatric Research Immune Network on SARS-CoV-2 and MIS-C (PRISM) (NCT04588363)**  
**Sponsor:** National Institute of Allergy and Infectious Diseases (NIAID)  
“This is a prospective, multicenter, observational cohort study to assess short and long-term clinical outcomes and immune responses after Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) infection and/or Multisystem Inflammatory Syndrome in Children (MIS-C) in children. ...  
“The primary objectives of this study are: to determine the proportion of children with Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) related death, rehospitalization or major complications after infection with SARS-CoV-2 and/or Multisystem Inflammatory Syndrome in Children (MIS-C); and to determine immunologic mechanisms and immune signatures associated with disease spectrum and subsequent clinical course during the year of follow-up.”

8  **COVID-19 Longitudinal Biomarkers in Lung Injury (COLOBILI) (NCT04747782)**  
**Sponsor:** Dr. Andrew Baker, Unity Health Toronto  
“Profile known and novel biomarkers in blood in COVID19 patients to characterize the host response to SARS-CoV-2 over time and in response to treatment. ...  
“The investigators will collect ... blood samples for state-of-the-art multi-omics biomarker discovery and development: cytokines, anti-COVID19 antibodies, autoimmune serology, metabolomics, transcriptomics, epigenomics, deep immune phenotyping, viral loads.”
9 Severe Acute Respiratory Syndrome Corona Virus 2 (SARS-CoV-2) Immune Kidney Transplant Study (COVID-19) (SCV-KTx-imm) (NCT04747522)
Sponsor: Oslo University Hospital

“Kidney transplanted patients with post-transplant follow-up visits at the national transplant center in Norway will be included before they are SARS-CoV-2 vaccinated. ...

“Baseline blood samples will be obtained before vaccination. ...

“Following vaccination, all patients and controls will have blood drawn 7-10 days as well as 4-6 weeks after the second dose. ... All samples will be analyzed with validated assays for SARS-CoV-2 immunoglobulin G (IgG) (anti-receptor binding domain (RBD) spike protein) using ELISA, flow cytometry bead arrays and SARS-CoV-2 neutralization assays or comparable techniques. Cells will be analyzed by flow and mass cytometry for activation and phenotype markers, and with functional assays for responsiveness (e.g. proliferation and cytokine production).”

10 Immunogenecity and Safety of VaccinemRNA-1273 in Elderly Volunteers (Over 65 y) Compared to Younger Ones (18–45y) (CoviCompareM) (NCT04748471)
Sponsor: Assistance Publique – Hôpitaux de Paris

“Phase II, comparative, non-randomized trial assessing the immunogenicity and safety of vaccine candidate Moderna-1273 against SARS-CoV-2. ...

“This study aims to evaluate the immunogenicity of Moderna mRNA-1273 vaccine in volunteers aged 65 years or more compared to volunteers aged 18–45 years, over 24 months duration. It will provide necessary data on the early immunological response to the vaccine and its evolution in quantitative and qualitative terms. This study will allow establishing how aging influences the response to the vaccine and help to adapt the vaccinal plan.”

11 COVID-19, Aging, and Cardiometabolic Risk Factors Study (CARAMEL) (NCT04802044)
Sponsor: Indonesia University

“The CARAMEL study aims to specifically describe the phenotypic aging and cardiometabolic characteristics of patients with COVID-19 infection, in relation with the changes in the mucosal and systemic immune system. Particular attention will be devoted to obesity, central obesity, prediabetes, diabetes, hypertension, dyslipidemia, as well as anti-diabetic, antihypertensive, and anti-dyslipidemia therapies.

“This study will provide answers to researchers, medical professionals, and especially patients, regarding the impact of aging and cardiometabolic risk factors for COVID-19 prognosis.”

12 BNT162b2 Vaccination With Two Doses in COVID-19 Negative Adult Volunteers and With a Single Dose in COVID-19 Positive Adult Volunteers (CoviCompareP) (NCT04824638)
Sponsor: ANRS, Emerging Infectious Diseases

“This is a national open phase II trial, assessing the immunogenicity and safety of vaccine candidate Pfizer-BNT162b2 against SARS-CoV-2 in participants with no history of SARS-CoV-2 infection receiving two doses of vaccine and in participants with history SARS-CoV-2 infection of more than 6 months and receiving only one dose of vaccine. ...

“We propose to evaluate the level of the single BNT162b2 vaccine dose response according to the severity of the previous SARS-CoV-2 infection in young and elderly participants with the same immunogenicity analyses to assess this response in participants receiving the two-dose vaccination regimen.”