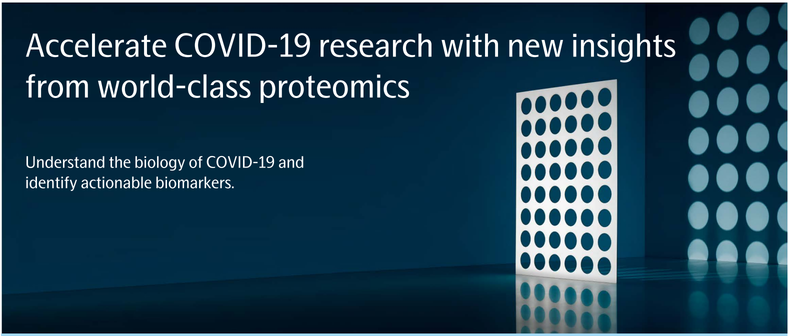
Olink



Accelerate COVID-19 research with new insights from world-class proteomics

Understand the biology of COVID-19 and
identify actionable biomarkers.

Make breakthrough discoveries with open hypothesis proteomics

Gaining **actionable insights** into a new disease is a significant challenge, especially under the time pressure of a global pandemic.

What if you could use an **open hypothesis** approach that allowed you to rapidly study the plasma proteome in a robust and high throughput mode to find correlations between protein biomarkers and disease, understand what **biological pathways** are involved and identify markers of disease stage, prognosis severity and immunological response etc?

Together with analysis of related comorbidities, this could enable the assessment of multiple **risk factors** for severe COVID-19, provide tools with which to **monitor** patients and identify potential **new drug targets**.

Olink - *the* proteomics solution for COVID-19 research

Actionable insights provide biological understanding to drive future therapy

- **Rapid, robust, high-multiplex assays. Actionable insights and data you can trust!**
- **Olink Explore using NGS enables readout of 1536 assays from <3 µL sample**
- **Biomarkers correlated to disease severity**
- **Understanding biological pathways**

The low abundant proteins reveal the most eye-opening insights for understanding biological pathways and disease

Most proteins show large variation in abundance between individuals. These variations are related to genetic, clinical and lifestyle factors. The abundance of different proteins in biological samples also varies enormously, with some at minute concentrations that have been hardly detectable. .

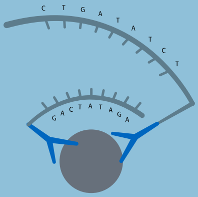
The **low abundant plasma proteome** contains the richest store of knowledge related to **dynamic** biological changes in health and disease. These proteins best define our **real-time biology** but have traditionally been the most difficult to measure, until now!

Revolutionary technology – data you can trust

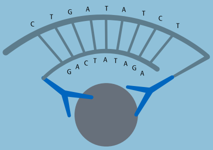
The sensitive Proximity Extension Assay needs less than one drop of blood to measure the protein profile in a patient sample.

- Matched **pairs of antibodies**, carrying unique **DNA-tags**, bind to the respective proteins in the sample.
- When the matched DNA-tags are brought into close proximity, they can **hybridize.**
- Only the correctly hybridized tags are extended to an amplicon with a **unique sequence** for each protein.
- Depending on the study, readout can be done with **NGS** or **qPCR.**
- Olink **Target 96** panels, using qPCR, each enable readout of 96 assays in 96 samples simultaneously.
- Olink **Explore** using NGS enables readout of 1536 assays in 96 samples simultaneously.

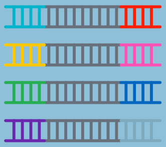
Analyze and detect > 1500 proteins simultaneously with Olink Explore



Immuno Reaction



Extension

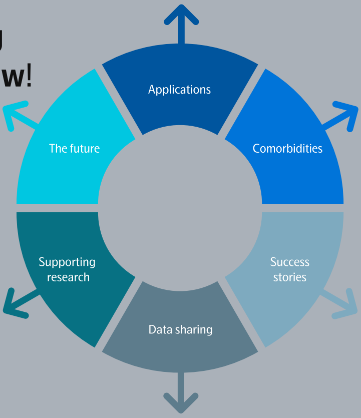


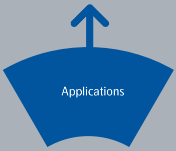
Detection by NGS

Read more at olinkexplore.com.

Protein biomarker studies using Olink are **accelerating** COVID-19 research **right now**!

Actions speak louder than words, and Olink analysis has been providing vital data in many COVID-19 studies around the world, covering a broad range of key applications. This has already led to a number of significant success stories, with **landmark publications** in top scientific journals. Olink has also been taking its responsibilities seriously to help the global effort against the pandemic, facilitating the **open sharing** of data and offering **special pricing** for COVID-19 studies.





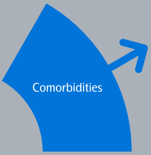
Prediction and prognosis of COVID-19 using Olink

Olink's protein biomarker panels are already being used in a significant number of on-going and planned COVID-19 studies across the world, covering a range of research objectives, including:

- Understand basic biology and prognosis of disease severity
- Patient **stratification** by disease severity
- Longitudinal sampling (to monitor disease progression and recovery)
- Prediction of **cytokine release storms** in COVID-19 patients
- Prediction/prevention of ARDS (Acute Respiratory Distress Syndrome)
- **Outcome predictions** in CVD patients with COVID19

Publication example:
Fraser, Douglas D. MD *et al.* COVID19 Study Team Novel Outcome Biomarkers Identified With Targeted Proteomic Analyses of Plasma From Critically Ill Coronavirus Disease 2019 Patients, *Critical Care Explorations* (2020)

Critical Care Explorations



Olink in comorbidity research

The presence of one or more additional clinical conditions along with COVID-19 is associated with worse health outcomes. Olink is being used in several studies looking at **comorbidities** such as:

- Cardiovascular disease
- BMI
- Renal dysfunction
- Neurological effects
- Hematological malignancies
- Dermatological diseases
- HIV

THE LANCET

Large epidemiological study of association of

Read publication

plasma ACE2 levels with CVD risk

Cardiovascular diseases have been one of the most studied comorbidities in connection with COVID-19. A study by researchers at Hamilton Health Sciences in Ontario, Canada, has examined the levels of the SARS-CoV-2 virus cellular receptor, ACE2, in more than 10,000 subjects from a highly diverse cohort from 5 continents. The Olink assay for ACE2 was used to measure this protein, and the authors found clear associations between plasma levels and the risk of major cardiovascular events, such as heart failure, stroke, and myocardial infarction.

The study was published in *The Lancet*.

Success stories

Radboudumc

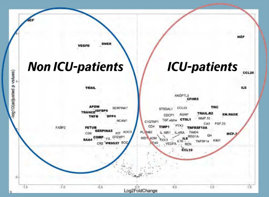
Read publication

Protein biomarkers of COVID-19 pathophysiology

An article by Frank van de Veerdonk and colleagues from the Department of Internal Medicine, Radboud UMC, Nijmegen, Netherlands, reports how targeted proteomics with Olink panels shows that COVID-19 patients share the same underlying pathophysiological mechanisms, but that there is clear **stratification** based on protein profiles between **mild and severe cases**. By investigating more broadly using almost 270 proteins, **novel and unexpected pathophysiological pathways** were identified that advance understanding of the disease and may provide starting points for **future therapies**.

"This is a very robust system – it works across plasma, serum and supernatant"

Leo Joosten, Professor of Mechanisms of Inflammatory Disease at Radboud UMC, Nijmegen



Cell

Read publication

Insights into a rare but severe complication in children with COVID-19

A study by Petter Brodin's group at the Karolinska Instituite has looked into **Multisystem Inflammatory Syndrome in Children** (MIS-C), where some children infected with SARS-CoV-2 develop high fever, organ dysfunction and express strongly elevated levels of inflammatory proteins. In this study, published in *Cell*, they show how this condition **differs from acute COVID-19 in adults**, and exhibits both important **similarities and differences** to children with the autoimmune vasculitis condition, **Kawasaki disease**.

Science AAAS

Immune response in mild versus severe COVID-19 infections

Read publication

A study published in *Science* led by researchers at Stanford University, reveals how the **immune system goes awry**, leading to severe disease during SARS-CoV-2 infections, and may point to **novel therapeutic targets**. Multiplex analysis of cytokines in plasma was used to assess the immune system and response of COVID-19 patients with mild-to-severe disease from two geographically distant cohorts. They revealed enhanced levels of several **proinflammatory cytokines** and strong association of the inflammatory mediators EN-RAGE, TNFSF14, and OSM with the **clinical severity** of the disease. These results reveal mechanisms and potential therapeutic targets for COVID-19.

Data sharing

Collaboration is key to success

In order to win this war against COVID-19, we need to work as one united community. This pandemic has had an impact not only on our everyday lives, but has also **changed how science is being done**. While society is putting up borders, scientists are breaking down their own. There is a huge energy coming from all fields of science all over the world, with researchers urgently focusing on the same goal of tackling the disease. **Collaboration** is key to success and we at Olink are also working to help research findings to be **shared rapidly and openly.**

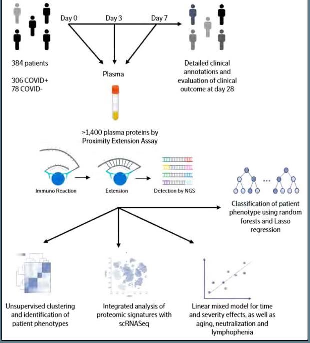
MGH
1811

Collaboration to investigate the plasma proteomic signatures of COVID-19 positive patients

Olink has contributed to one of the largest longitudinal COVID-19 studies together with the prestigious Massachusetts General Hospital (MGH). In close collaboration with the team at MGH, the data was made **freely available** to all scientists to help accelerate COVID-19 research.

Read more

This was one of the first major protein biomarker studies run on the new **Olink Explore 1536** platform, enabling over **1400 proteins** to be rapidly analyzed in a cohort of around 400 COVID-19 patients and control subjects. With over **1.3 million protein data points** generated, along with associated clinical parameters, this invaluable dataset enabled the wider scientific community to augment others' findings and to **accelerate discovery** that may lead to **new therapies** and a **better understanding** of the underpinnings of COVID-19. Using Olink Explore, they identified proteins that may predict severity and outcome of COVID-19 infections in patients at the time of hospital admission.


Day 0
Day 3
Day 7
384 patients
306 COVID+
78 COVID-
Plasma
Detailed clinical annotations and evaluation of clinical outcome at day 28
>1,400 plasma proteins by Proximity Extension Assay
Immuno Reaction
Extension
Detection by NGS
Classification of patient phenotype using random forests and Lasso regression
Unsupervised clustering and identification of patient phenotypes
Integrated analysis of proteomic signatures with scRNASeq
Linear mixed model for time and severity effects, as well as aging, neutralization and lymphophenia

Supporting research

Discount

Discounted pricing for analyzing SARS-CoV-2 infected samples

This is a difficult time, with many disruptions to life in general, and a great pressure on the scientific community in particular to deliver answers and solutions. Along with funding bodies, scientific journals and other organizations, we at Olink are determined to help speed up the gathering and publication of the essential data needed to deal with the current global pandemic. At this time, we feel that one of the most practical contributions we can make is to offer a **substantially reduced price for COVID-19 related studies.**

The future

Publication example:
Del Valle, D.M. *et al.* An inflammatory cytokine signature predicts COVID-19 severity and survival. *Nat Med* (2020).

nature medicine

How plasma proteomics can help drug repositioning and vaccine development programs for COVID-19

To date, the cellular mechanisms underlying the **immune response** and **disease severity** of COVID-19 are still poorly understood and a comprehensive overview of the **inflammation** processes of COVID-19 is still lacking.

There is significant **variance** in disease severity of COVID-19 with many unknowns on why some people are facing severe outcomes and **multiple organ systems** are impacted by the disease causing short- and long-term effects.

What we need for future studies of COVID-19

- Broaden our understanding of the **pathophysiology** behind COVID-19 with deep profiling of the inflammatory system
- **Predictors** of disease severity and ways to stratify patients in the

context of outcomes

- Biomarkers correlative to **viral load** or subsequent viremia
- Understanding of **therapeutic impacts** on multiple organ systems and inflammatory biomarkers
- Identification of **new therapeutic targets** and methods to evaluate **drug repositioning** to treat COVID-19 patients

Accelerating COVID-19 research

Open hypothesis proteomics studies

New protein biomarkers with potential to monitor and treat patients

Rapid, reliable analysis of many hundreds of proteins

Protein profiles providing real insights into disease biology

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