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COVID-19 and the SomaScan® Platform

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Introduction

The battle against coronavirus disease 2019 (COVID-19) only begins with a test to identify who is infected and who is not. To accelerate an effective response, we have to move beyond the initial diagnosis to prognosis: Who is most susceptible to developing serious, life-threatening symptoms?

Currently, there is no way to tell whether an infected individual (or an individual who may become infected) will be asymptomatic or require hospitalization. This wide variation in disease severity is, at least in part, a reflection of the myriad changes that occur within a person's body as it fights the virus, which in turn reflect the unique biological makeup of that individual.

The response of the human host to any infectious agent is based primarily on proteins that circulate throughout the body and transmit information across organs and biological systems. These protein changes occur dynamically and are influenced by many factors beyond infection, including such things as age, diet, stress, chronic conditions, medications and even genetics. Measuring thousands of protein changes in the body thus uniquely provides systemic, real-time information that reflects not only current health, but also disease trajectory, as well as the effects of therapeutic interventions.

The SomaScan Assay measures 7,000 proteins simultaneously, over a wide concentration range, in a small sample of blood. The assay has been run more than 300,000 times and has led to the publication of over 200 studies across more than 50 different diseases and conditions. This ability to measure proteins at scale is "disease agnostic" and is incredibly useful in understanding the underlying biology of any specific disease or condition — including COVID-19.

Many of the previously published studies have used the SomaScan Assay to address questions that are pertinent to COVID-19, such as: Who will get sick and who won't? Who is at high risk of getting severe disease? Is there a better way to find and test candidate drugs and/or vaccines?

Below are a few select examples that illustrate the power of the SomaScan proteomics technology and how it can help researchers measure systemic host changes in the infection and disease cycle, reliably and cost effectively, in individuals and across populations.

Who is at risk of getting severe disease?

Like COVID-19, tuberculosis (TB) is an ongoing infectious disease pandemic. Approximately one quarter of the world's population is infected with TB bacteria, but do not exhibit disease symptoms. Even though these people do not feel ill, they are at risk of developing active TB disease in the future and spreading it to others—more than 80% of TB cases in the US are due to untreated latent infection[1].

To help to identify individuals at high risk of progressing to active disease, an international team of scientists used a previous version of the SomaScan Assay to measure the levels of over 3,000 proteins in plasma collected from healthy TB-infected adolescents[5].

They identified 135 proteins that were significantly different in those who developed active TB compared to those who remained healthy, and they successfully validated two different combinations of three or five proteins that could predict the subset who developed the disease within a year. These were the first validated protein biomarkers with prognostic value for TB.

The SomaScan Assay has also been used to find protein biomarkers that can predict outcomes for patients with cardiovascular[3], kidney[10] and liver disease[7]. These studies demonstrate that circulating proteins are prognostic of health throughout the body. This is particularly important for COVID-19, which can ravage not just the lungs, but other organs including the kidneys, liver and heart.

Finding proteins that could predict who is at greatest risk for severe COVID-19 could lead to a test that would allow people at low risk to return to the workforce regardless of their immune status. Such a test would also help healthcare providers identify high-risk individuals who should get first access to new therapeutics and vaccines, which are likely to be in limited supply.

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Is there a better way to find and test candidate drugs and/or vaccines?

It is unclear why some people infected with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) experience mild or even no symptoms, while others experience acute respiratory distress or multi-organ failure.

Many of the sickest COVID-19 patients have very high levels of proinflammatory proteins called cytokines in their blood and these "cytokine storms" could be causing the body to attack itself rather than the virus, with lethal effects[4]. Existing therapeutics that block cytokines such as interleukin 6 (IL-6) are under investigation for treating COVID-19 patients, but it's unclear how effective these drugs may be since so little is known about the host response to infection.

Cytokine storms also occur in autoimmune conditions such as idiopathic multicentric Castleman disease (iMCD). iMDC symptoms and progression are believed to be largely driven by excess IL-6, yet most iMCD patients do not respond to IL-6-blocking treatments.

To gain insight into the biology behind iMCD pathogenesis, a team led by researchers at the University of Pennsylvania used a previous version of the SomaScan Assay to measure the levels of 1129 plasma proteins in iMCD patients[6].

Distinct protein profiles distinguished the patients who failed to respond to siltuximab or tocilizumab, two Food and Drug Administration (FDA)-approved anti-IL-6 therapies that are also being investigated as COVID-19 treatments. These results suggest that different mechanisms are important in the disease biology of nonresponders.

This study illustrates how scanning blood proteins can help identify different disease subgroups, which will be important for stratifying COVID-19 patients for clinical trials, deconvoluting complex inflammatory responses to SARS-CoV-2, and finding and validating targeted treatments that can tamp down an overactive immune response.

What are the long-term effects of COVID-19?

While it's too soon to know if survivors of COVID-19 will suffer long-term effects from the viral infection, the ensuing inflammatory response or even from life-saving treatments, studies of other coronavirus illnesses such as Middle East respiratory syndrome (MERS) and severe acute respiratory syndrome (SARS) suggest that some people may never fully recover[2,9].

Since SARS-CoV-2 can seemingly attack the body anywhere — lungs, heart, blood vessels, kidneys, liver, gut, brain — it's possible that COVID-19 survivors may have permanent or undetected damage that puts them at greater risk for developing other diseases or conditions.

A recent study, by an international team led by researchers from the University of California San Francisco, University of Cambridge and SomaLogic, showed that large-scale measurement of proteins in a single blood test can provide holistic information about an individual's current health and predict a range of future disease risks[8].

The researchers used the SomaScan Assay to measure the levels of ~5,000 proteins in blood samples from nearly 17,000 people and developed protein models that successfully predicted 11 different health indicators — including kidney function, liver condition, cardiopulmonary fitness and cardiometabolic disease risk — all from a single blood draw.

Many of the models are now commercially available as SomaSignal™ tests and could provide a one-stop "liquid health check" for understanding COVID-19 outcomes, delivering early warning signs of future disease, and finding preventative treatments.

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Summary

There are many uncertainties that still exist in our understanding of COVID-19 disease and human immunity, but SomaLogic's SomaScan Proteomics Platform can be a critical tool needed to arrive at greater understanding and clarity.

By measuring thousands of proteins in real time — something that has been done repeatedly and productively for other diseases and conditions — researchers and clinicians can begin to piece together not just the biology of COVID-19, but new ways to better manage the entire course of infection, or even prevent it.

Key Terms

CoV	Coronavirus
COVID-19	Coronavirus disease 2019
FDA	Food & Drug Administration
IL-6	Interleukin 6
iMCD	Idiopathic multicentric Castleman disease
MERS	Middle East respiratory system
SARS	Severe acute respiratory syndrome
SARS - CoV - 2	Severe acute respiratory syndrome coronavirus 2
TB	Tuberculosis

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Founded in 2000, SomaLogic, a global leader in proteomics, pioneered the SomaScan Platform with unparalleled coverage. Unlike any other technology, the SomaScan Assay enables users to take up to 11,000 protein measurements from just 55 µL of various body fluids like plasma, serum, CSF, and urine.

The proprietary SomaScan Assay measures proteins with high specificity, high throughput, and high reproducibility, which enables the possibility of faster, more precise drug discovery. Our A.I. and machine learning-powered bioinformatics algorithms, operated in tandem with the company's database of more than 750,000 protein samples, helped to create a growing suite of SomaSignal® Tests. These tests provide additional insights into the current health status of patients and the future risk of conditions and diseases. Custom and disease-specific panels are also available for a more targeted approach.

LEARN MORE - https://somalogic.com/somascan-assay-services/

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