

Blood test could identify COVID-19 patients at risk of cytokine storm

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Southampton researchers have identified a blood profile that could help identify COVID-19 patients at greatest risk of deterioration and direct them towards trials of specific treatments that could modify their immune systems' responses.

A new study jointly led by Professor Tom Wilkinson and Dr. Tristan Clark of the University of Southampton, has shown a [blood test](#) for five cytokines could help predict those at risk of life-threatening overstimulation of immune defenses by COVID-19, and potentially tailor their treatment to tackle this.

Preventing a cytokine storm

Cytokines are cell signaling molecules with many associated with inflammation released into the bloodstream after an infection, helping to drive protective immune responses.

In patients with severe COVID-19, the immune system can overreact leading to massively increased cytokine levels in the blood—a 'cytokine storm'. Instead of helping the body fight the virus, this overreaction is extremely damaging to the cells and tissues of the body itself and can be fatal.

Identifying those more prone to this response, and tackling the hyperinflammation could be a key route to reducing the severity of COVID-19 and deaths.

Identifying patients most at risk

The study, published in *Respiratory Research*, analyzed blood samples from 100 COVID-19 positive patients between 20 March and 29 April 2020, during the first phase of the pandemic.

They found that high levels of cytokines IL-6, IL-8, TNF, IL-1 β and IL-33 in the patients' blood on admission were associated with greater chance of needing intensive care, artificial ventilation and of dying. IL-1 β and IL-33 showed the biggest effect.

Combining this [cytokine](#) test with a clinical assessment of the patients' condition could help doctors identify and treat those most at risk of deteriorating.

Dr. Anna Freeman and Dr. Hannah Burke, Respiratory Clinical Research Fellows and joint first authors commented: "This project was a great opportunity for collaboration within the Faculty of Medicine, using resource from both the respiratory and infectious diseases teams.

"As early career researchers this study provided us with a valuable learning opportunity about how to deliver academic impact within the evolving COVID-19 pandemic."

Investigating new treatments

Two treatments for those hospitalized with COVID-19 have been found so far, with the steroid dexamethasone shown to reduce deaths by up to a third, in patients needing oxygen. The mechanism for Dexamethasone's protective effects isn't known, but as a non-specific anti-inflammatory it points to the potential benefit of controlling the inflammatory immune response.

The Southampton team hope that by accurately identifying which cytokines are driving hyperinflammation in each COVID-19 patient, doctors could target them (such as with an IL-33 blocker current in UK trials), yielding the biggest benefits for individual patients– an approach known as precision medicine.

Professor Tom Wilkinson said: "These findings, from the ongoing COVID research program in Southampton, have identified important inflammatory signals which will help steer the development of treatment strategies for this new disease.

"It is increasingly apparent that COVID is highly heterogeneous. Only by applying these techniques to stratify the condition will we be able to target the key mechanisms of disease with the best treatment for that individual."

Dr. Tristan Clark said: "Our findings suggest that testing for both COVID-19 and cytokines at the point-of-care is feasible and in the future may identify infected patients and the most appropriate treatment for them, in near real-time."

More information: undefined undefined et al. Inflammatory phenotyping predicts clinical outcome in COVID-19, *Respiratory Research* (2020). [DOI: 10.1186/s12931-020-01511-z](https://doi.org/10.1186/s12931-020-01511-z)

Provided by University of Southampton

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