Blood test at COVID-19 diagnosis can predict disease severity, study finds

30 June 2020

Credit: CC0 Public Domain

Doctors can examine COVID-19 patients' blood to identify those at greatest risk of severe illness and to pinpoint those most likely to need a ventilator, new research from the University of Virginia School of Medicine suggests.

The discovery could lead to new treatments to prevent deadly "cytokine storms" seen in severe cases of COVID-19. It also may help explain why diabetes contributes to worse outcomes in patients with the coronavirus.

The UVA scientists found that the levels of a particular cytokine in the blood upon diagnosis could be used to predict later outcomes. Cytokines—proteins produced by immune cells—are responsible for severe overreactions by the immune system, known as cytokine storms, associated with COVID-19 and other serious illnesses.

The researchers say the discovery could become part of a scoring system to let doctors flag at-risk COVID-19 patients for closer monitoring and personalized interventions. The finding also identifies cytokines doctors could target as a new treatment approach.

"The immune response that we discovered to predict severe shortness of breath in COVID-19 is known in other pulmonary diseases to cause damage. So this could lead to a novel way to prevent respiratory failure in individuals infected with the new coronavirus, by inhibiting this immune cytokine," said Dr. Bill Petri of UVA's Division of Infectious Diseases and International Health. "We plan to test this in a model of COVID-19 prior to considering a clinical trial."

COVID-19 Cytokine Storms

Cytokine storms, in which the immune system spirals out of control, are typically associated with an established group of cytokines. But the best predictor of COVID-19 outcomes was an "underappreciated" cytokine more associated with allergies, the UVA researchers report. High levels of that cytokine, IL-13, were associated with worsened COVID-19 outcomes regardless of patients' gender, age or other health problems.

The researchers also identified two more cytokines associated with severe outcomes, though the duo had less ability to predict the need for a ventilator.

In addition, the researchers found that levels of two other cytokines were significantly higher in patients with elevated blood sugar. This "pro-inflammatory response," they say, may help explain why diabetes is associated with worse COVID-19 outcomes. In short, the body is primed to respond too strongly to the infection.

"This work was led by Allie Donlan, Mary Young and Mayuresh Abhyankar in my lab," Petri said, "but it was also a huge team effort by the School of Medicine with the support of iTHRIV and the Global Infectious Diseases Institute."

About the Cytokine Research

To draw their conclusions, the researchers identified 57 COVID-19 patients treated at UVA who ultimately required a ventilator. They then tested blood samples taken from the patients within 48 hours of diagnosis or hospital admission. They compared the results with those from patients who did not wind up needing a ventilator.

The researchers say additional research is necessary to determine how the cytokines are contributing to COVID-19 outcomes, but they hope the discovery will help doctors improve care for a disease that has now killed more than 125,000 Americans.

Provided by University of Virginia