Whole-blood RNA profiling of severe COVID cases

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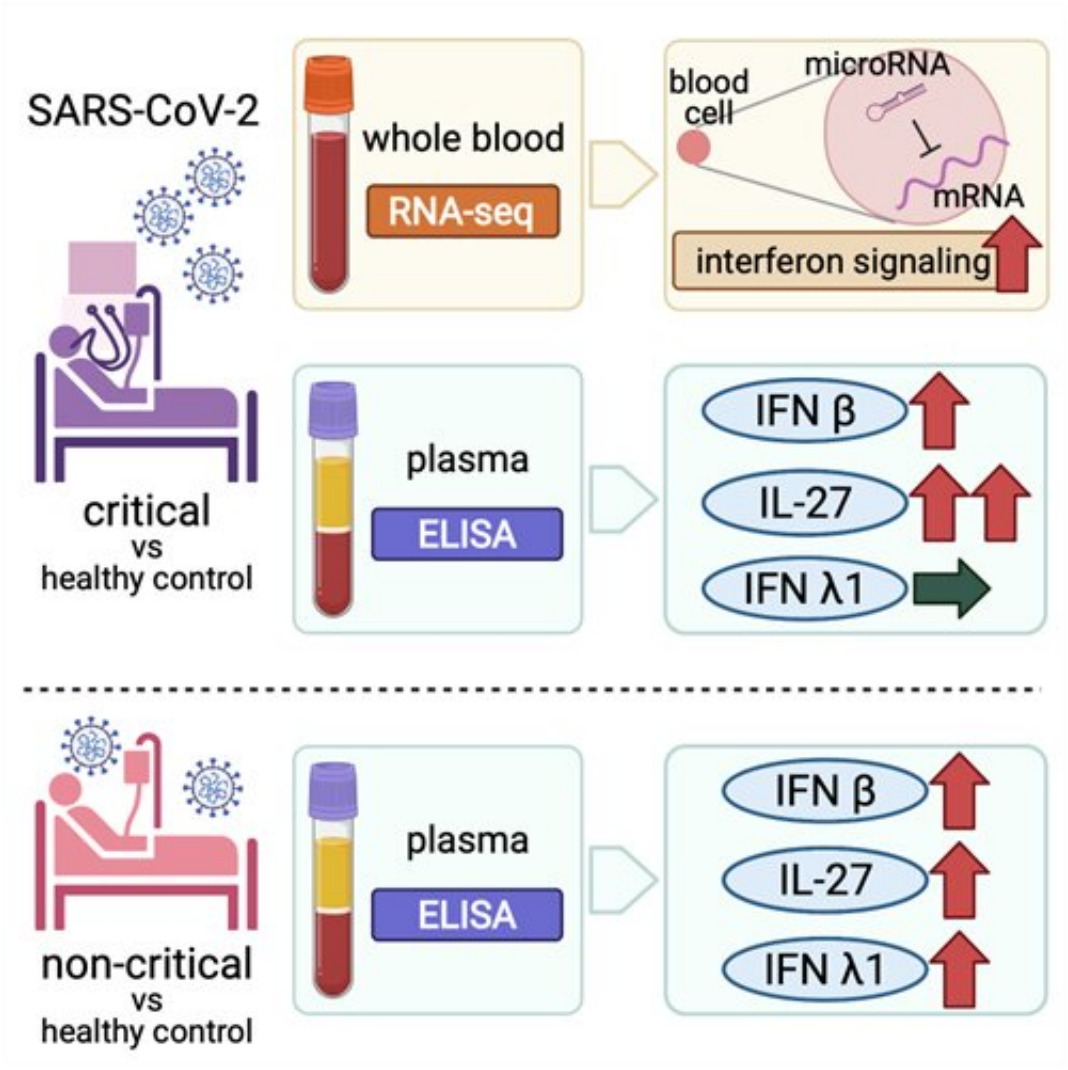

Credit: 2022 Yuki Togami et al., Significance of interferon signaling based on mRNA-microRNA integration and plasma protein analyses in critically ill COVID-19 patients, Molecular Therapy-Nucleic Acids

Just as a recipe contains the instructions needed to make a dish, messenger ribonucleic acid (mRNA) sequences in the body contain the information needed to make proteins. Changes in the expression of specific mRNAs and short RNA sequences known as microRNAs, which can act to suppress protein synthesis, may accompany disease. Recently, researchers in Japan have uncovered changes in mRNA and microRNA expression patterns that occur in the blood during severe COVID-19 infection.

In a new study published in *Molecular Therapy—Nucleic Acids*, researchers led by Osaka University comprehensively analyzed the mRNA and microRNA profiles of whole blood samples from patients with severe COVID-19 using a technique known as RNA-sequencing. RNA-sequencing allows for the evaluation of all of the RNA content expressed within a population of cells.

As COVID-19 continues to affect the global population, further insight into the mechanisms underlying the pathogenesis of COVID-19 is needed. To this end, the Osaka University-led research team sought to examine RNA expression in the blood of patients with severe COVID-19 to determine how mRNA and microRNA expression profiles are affected by COVID-19.

"We collected whole blood samples from critically ill COVID-19 patients and healthy controls and performed RNA-sequencing to evaluate differences in mRNA and microRNA expression," says lead author of the study, Yuki Togami.

RNA-sequencing analysis revealed specific mRNAs and microRNAs that were differentially expressed between severely ill patients with COVID-19 and healthy controls. Integrated analysis of mRNA and microRNA expression profiles further showed that an immune response pathway known as the interferon signaling pathway was activated in

patients with severe COVID-19.

"On the basis of the results of our analysis, we measured interferon protein levels in patient plasma and found notable differences in the expression of two interferon pathway members, interferon-β and interferon-λ1," says senior author, Hiroshi Ogura.

Interferon-β was found to be elevated in COVID-19 patients in a manner that corresponded with illness severity, while interferon-λ1 expression was higher in non-critically ill patients compared with healthy controls, but lower in critically ill patients compared with non-critically ill patients. The research team's findings indicate that interferon-β and interferon-λ1 play an important role in the severity of COVID-19. Enhanced understanding of the cellular mechanisms underlying COVID-19 pathogenesis may aid in the development of therapeutics to treat severe COVID-19.

More information: Yuki Togami et al, Significance of interferon signaling based on mRNA-microRNA integration and plasma protein analyses in critically ill COVID-19 patients, *Molecular Therapy—Nucleic Acids* (2022). DOI: 10.1016/j.omtn.2022.07.005

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