Medical Xpress

Predicting and preventing serious COVID-19 symptoms

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Scientists in Leiden are looking for signals in blood samples to predict whether patients will develop serious COVID-19 symptoms or not. Based on that knowledge, they will be able to propose targeted therapies

to prevent serious symptoms. They hope to come up with the first results within the week.

Traces of diseases in the body

Every process in the body—including disease processes—leaves traces in the form of small molecules. These molecules in our blood provide a lot of information. For example, it is often possible to trace which foods or medicines have been swallowed or administered, or they can be used to determine whether someone has been exposed to air pollution. Some of these molecules in the blood are themselves the trigger for crucial processes in the body. These can be 'healthy' processes, but also unwanted ones, such as blood vessel leakage and blood clotting.

Predicting symptoms

Scientists can measure all these substances in blood to gain information about a person's health. Leiden scientists in the group of Professor of Analytical life sciences Thomas Hankemeier have a lot of experience with this branch of science, which is called metabolomics. Hankemeier: "We would like to contribute to the fight against COVID-19. With our metabolomics technologies, we are looking for factors in the blood that predict which COVID-19 patients will develop serious symptoms and which will not."

Hankemeier and colleagues have started systematically mapping all kinds of small molecules in the blood of COVID-19 patients: amino acids, fatty acids, bioactive lipids, small chemicals from the environment and many more. They will compare the resulting profiles to clinical data of the patients. In this way, they hope to find molecules that are predictors for certain COVID-19 complaints.

Reducing COVID-19 symptoms

After mapping these molecules, the researchers will then further investigate these particles . In what processes in the body do they play a role? Has the virus hijacked metabolic processes? Are there any inflammatory reactions or vascular problems that may play a role in the development of serious and critical symptoms? Are there any outside chemicals that make the disease worse?

Hankemeier: "We would like to understand the underlying routes or environmental factors that (co-) direct the development of serious and critical symptoms. This allows us to look for ways to adjust these processes, for example with existing or new medicines. Those insights will help to find ways to improve the resilience of COVID-19 patients and to develop less severe symptoms."

Collaborations

Hankemeier's group is collaborating with researchers, clinicians and intensive care specialists from LUMC, Erasmus MC and UMCU, medical centres that also provide clinical samples from COVID-19 patients. The researchers are also open to other collaborations. To study the environmental substances in the blood, they are working together with Utrecht University Professor Roel Vermeulen in the Exposome-NL Gravitation project .

Testing in mini-organs

To test the effect of potential treatments, the scientists use artificial patient-derived organs (organs-on-a-chip). Because tens to a hundred mini-organs fit on a single chip, scientists can quickly perform many different tests with them. For this purpose Hankemeier's group has

academic collaborations with, among others, professor Anton-Jan van Zonneveld of the LUMC and Leiden-based company Mimetas. Barend Mons and Arie Baak from Euretos contribute their expertise (including on the VODAN network and artificial intelligence) to integrate the new experimental data with available knowledge about COVID-19. Hankemeier: "Based on all public knowledge, we have developed ideas with other researchers on how you can probably treat patients in the different stages of the disease. We will evaluate the resulting hypotheses with a team of experts and test potentially successful interventions on the organs-on-a-chip."

Fast results

In this way, Hankemeier and his group hope to contribute to the treatment of COVID-19 patients. Their first results are expected within the week. Hankemeier is already in contact with pharmaceutical and clinical food companies in Leiden and the rest of the Netherlands, so that action can be taken quickly and any treatments can be delivered quickly.

Provided by Leiden University

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