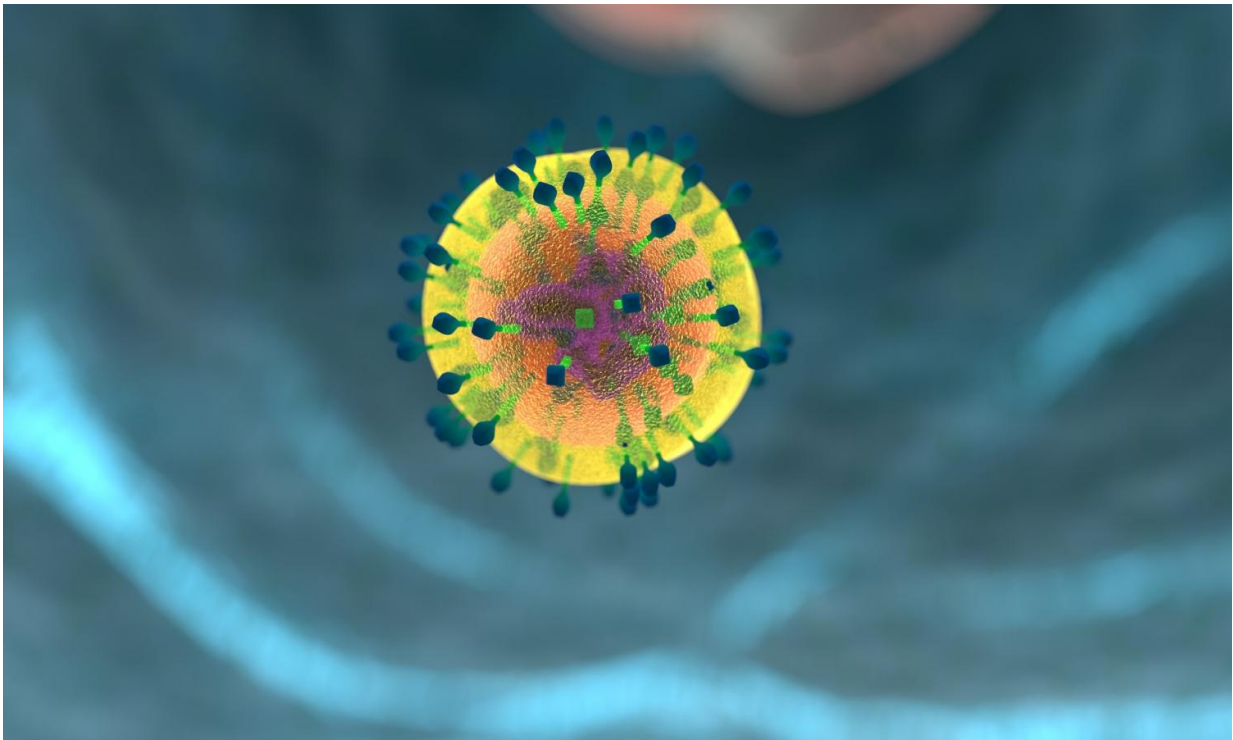


New tool demonstrates differences in human immune systems

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Immune system function varies significantly between individuals, and up to now there has been no effective means of measuring and describing these differences. Now, researchers at Karolinska Institutet have shown that white blood cell composition is unique in individuals, and that the composition of these cells may predict immune system response to

various forms of stimulation. The study, which is published in *PNAS*, paves the way for more individualised treatment of diseases involving the immune system, e.g. autoimmune disorders, allergies and various forms of cancer.

The human immune system comprises a complex network of different [white blood cells](#), which coordinate their efforts in order to combat different external and internal threats. This network varies widely between different [individuals](#), but the differences have been difficult to measure and understand.

Together with colleagues at the Massachusetts Institute of Technology (MIT) and Stanford University in the USA, researchers at Karolinska Institutet and the Science for Life Laboratory (SciLifeLab) have developed a tool for measuring the unique composition of white [blood cells](#) in individuals. Researchers have also found that the test may predict how individuals will respond to a given treatment, e.g. individual response to an influenza vaccine.

Measuring the individual's "immunotypes"

"By measuring all populations of white blood cells in the blood at the same time, we can describe the composition of an individual's immune system and show that this is unique for the individual. We call this measure, the individual's "immunotype". We have also found that this immunotype makes the complex immune system more understandable and predictable," says Petter Brodin, physician and researcher at SciLifeLab and the Department of Medicine, Solna, at Karolinska Institutet.

A human immunotype is not constant, but varies over time in response to external factors. In previous studies, Petter Brodin and his research colleagues have shown that in humans individual differences in immune

defence can be attributed primarily to the many different environmental factors unique to each individual, e.g. diet, infections, vaccines and microflora.

Blood samples from 1,500 individuals

In the study in question, the researchers analysed [blood samples](#) from approximately 1,500 healthy individuals and tested in vitro how their white blood cells respond to different stimuli. They have also vaccinated individuals against influenza and studied which antibody protection the individuals developed thereafter. It transpired that all different types of stimulation could be predicted based on the individual's immunotype, which was surprising – according to Petter Brodin.

"Our technique can be scaled up, and my hope is that eventually it will be used clinically to predict those individuals who may benefit from a particular immunological treatment or a certain vaccine. The technique may also contribute to more individualised drugs to treat autoimmune disease and allergies, as well as immunotherapy to treat cancer, which can be adapted based on the individual's immune response," says Petter Brodin.

More information: Kevin J. Kaczorowski et al. Continuous immunotypes describe human immune variation and predict diverse responses, *Proceedings of the National Academy of Sciences* (2017). [DOI: 10.1073/pnas.1705065114](https://doi.org/10.1073/pnas.1705065114)

Provided by Karolinska Institutet

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