

New biomarkers may enable personalized influenza vaccination schedule

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While influenza infection is a significant public health threat, causing serious illness in between three and five million people worldwide per year and leading to about up to 650,000 deaths, the effectiveness of

influenza vaccines varies considerably between individuals depending on vaccine types and individual circumstances. A person's ability to resist infection (host immunity) plays an important role in this.

Now, researchers have developed a way of classifying host immunity in individuals, which may lead to the early identification of those who will not respond well to a regular vaccine schedule and therefore allow them to receive different vaccine regimes to provide them with long-lasting immunity. This will not only reduce influenza-related illness but also reduce the logistical and [financial burden](#) it causes to health care systems, they say.

Presenting the results of their study to the [annual conference of the European Society of Human Genetics](#), Dr. Nhan Nguyen, a postdoctoral researcher at Professor Yang Li's group, from the Center for Individualized Infection Medicine, a joint venture of the Helmholtz Center for Infection Research and Hannover Medical School, Hannover, Germany, and colleagues describe how they took [blood samples](#) from 286 healthy donors aged 18–81, 45% of whom were women, during four influenza seasons in order to try to identify those who would be unprotected against influenza after vaccination.

"After examining their pre- and post-vaccination antibody status, we used multiomics technology to identify proteins and metabolites that could serve as predictive markers for the identification of individuals who have low levels of protection even after vaccination," says Dr. Nguyen.

"This is a more sophisticated way of identifying such people than that which is used at present, where protection is assessed solely by changes in the number of antibodies in the blood pre- and post-vaccination."

The [influenza vaccine](#) is updated every year in response to variations in

the virus, and this means that the pre-vaccination antibody level can differ in individuals due to previous infection or their vaccination history.

The current vaccine response calculation may therefore not provide host-specific information that is sufficiently accurate to estimate a person's immune response and/or vulnerability to future infections, since some people already have high antibody levels at pre-vaccination that do not change significantly after they have received a vaccine.

The results were consistent over the four flu seasons and the four different updates of the flu vaccines.

"Each seasonal influenza vaccine is designed to protect against three or four different flu viruses, so a lot of factors are involved in an individual's vaccine response. We aimed to identify the robust signals of response that spanned across different influenza seasons and were consistent despite the variations in the response of the same individual to different flu viruses," says Dr. Nguyen.

The researchers hope that the biomarkers they have identified as being related to an individual's vaccine response will enable the development of personalized influenza vaccine administration, for example, higher dose vaccines, repeated vaccinations, or vaccines including an adjuvant to boost response.

These biomarkers in turn will reduce the cost of vaccine response screening, as well as increasing protection against infection. They believe that their research could lead to the development of individualized adapted strategies for the administration of influenza vaccines.

"We are now testing a molecule that could act potentially as a predictive biomarker as well as a modulator of influenza vaccine response. We are

also exploring the possibility of developing a market product such as a [diagnostic test](#) based on our results. And we hope to further explore the idea of personalized influenza vaccination based on the biomarkers we have identified in this study," Dr. Nguyen concludes.

Professor Alexandre Reymond, from the Center for Integrative Genomics, University of Lausanne, Lausanne, Switzerland, and chair of the conference, says, "Personalized health is all about identifying the fraction of individuals of the population who are at risk in order to be able to treat them specifically. Importantly, this will benefit these individuals and decrease the burden on the health system, which in turn will benefit everybody."

More information: Abstract no. C24.4 A collective influence of genetic background on influenza vaccinees responses

Provided by European Society of Human Genetics

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