Differences in individuals' immune responses linked to flu vaccine effectiveness

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For the first time, scientists have identified how differences in individuals' immune responses might be linked to the effectiveness of the seasonal influenza vaccination programme. The findings are published in the journal, *Immunology*.

There is good evidence that flu vaccination differs in effectiveness between individuals; this is due to a number of factors, one of which is age - people's immune system generally become less effective as they get older. However, to date, we don't have a method that allows us to predict this variation amongst individuals and who will and won't respond optimally to the vaccine. This matters because people who produce an appropriate response to the flu vaccine are more likely to benefit from its protection and less likely to contract flu.

In this study, researchers, led by Dr Gregory Poland and Dr Richard Kennedy from the Mayo Clinic, set out to examine how differences in specific types of immune cells correlate with an individual's immune response to the seasonal flu vaccine. They gave the seasonal influenza vaccine to 159 people aged from 50-74 years. They took blood samples from these people prior to vaccination and again at day 3 and day 28 post-vaccination. These samples were analysed using flow cytometry to work out the relative levels of different types of immune cell at each time point. The researchers also investigated how much immunity to the flu virus each person showed at day 28 by assessing the number of antibodies and B cells (which make antibodies) present against the flu strains they had been vaccinated against - higher levels meant an

increased immune response and better immunity against the flu virus.

They found that individuals differed significantly in their responses to the flu vaccine and in how effective it proved to be; these differences were correlated with a number of immune cell parameters. People who had a better antibody response to the vaccine after 28 days had higher levels of HLA-DR (a cell surface protein which is a marker for immune stimulation) on a specialised type of dendritic cells, a key cell responsible for co-ordinating immune responses. Prior to vaccination, these people also had more B cells in their blood, with more CD86 (a cell surface protein that allows the immune system to be activated quickly in response to a threat).

These results show that individuals do exhibit meaningful differences in how their immune systems respond to vaccination against seasonal flu, which correlate to the level of immunity they show against flu after vaccination. Understanding more about how immune system function and response differs on an individual level will improve our ability to design and create more effective vaccines.

Researcher Dr Gregory Poland from the Mayo Clinic, Rochester said:

"Flu vaccination is an important tool in helping us prevent people getting ill from flu, particularly those who are at risk of additional complications such as older people and those with chronic health conditions. However, we've known for a while that individuals respond differently to the flu vaccine but we don't know why this is.

"Our research identifies key parameters within the immune system that people who show a good response to the flu vaccine exhibit. This information is important as it allows us to understand why some people might gain better immunity against flu from having the vaccine compared to others. However, we now need to examine the relationship

between these factors in more detail to ensure we fully understand how these factors are linked. Ultimately, we hope that increasing our understanding of how the immune system functions at a cellular level will allow us to develop more effective vaccines, protecting the public from preventable diseases."

More information: *Immunology*, DOI: 10.1111/imm.12599

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