Seasonal flu vaccines boost immunity to many types of flu viruses

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Seasonal flu vaccines may protect individuals not only against the strains of flu they contain but also against many additional types, according to a study published this week in *mBio*, the online open-access journal of the American Society for Microbiology. The work, directed by researchers at St. Jude Children's Research Hospital in Memphis, Tenn., found that some study participants who reported receiving flu vaccines had a strong immune response not only against the seasonal H3N2 flu strain from 2010, when blood samples were collected for analysis, but also against flu subtypes never included in any vaccine formulation.

The finding is exciting "because it suggests that the seasonal flu vaccine boosts antibody responses and may provide some measure of protection against a new pandemic strain that could emerge from the avian population," said senior study author Paul G. Thomas, PhD, an Associate Member in the Department of Immunology at St. Jude. "There might be a broader extent of reactions than we expected in the normal human population to some of these rare viral variants."

Because avian influenza viruses have an important role in emerging infections, Thomas and colleagues tested whether exposure to different types of birds can elicit immune responses to avian influenza viruses in humans. They studied blood samples taken from 95 bird scientists attending the 2010 annual meeting of the American Ornithologist Union. They exposed plasma from the samples to purified proteins of avian influenza virus H3, H4, H5, H6, H7, H8 and H12 subtypes using two laboratory tests to see how many different viruses participants reacted to, and how strongly. The first test, ELISA, measures if any antibodies—proteins produced by the body that are used by the immune system to identify and neutralize foreign objects such as bacteria and viruses - combine in any way to a protein called HA on the surface of the virus. The second, HAI, measures if antibodies can bind to HA and interrupt its association with a substance viruses use to get inside human cells.

In the ELISA tests, 77 percent of participants had detectable antibodies against avian influenza proteins. Most individuals tested had a strong antibody response to the seasonal H3N2 human virus-derived H3 subtype, part of that year's vaccine (2009-2010), but many also had strong measurable antibody responses to group 1 HA (avian H5, H6, H8, H12) and group 2 HA (avian H4, human H7) subtypes. Sixty-six percent of participants had some level of detectable antibodies against four or more HA proteins, and a few had responses to all subtypes tested, most of which have not previously been detected in the human population.

In additional experiments, the scientists found that participants who had significant antibody responses did not necessarily also have significant immune system T cell responses to avian viruses, indicating that these two arms of immunity can be independently boosted after vaccination or infection; that individuals who reported receiving seasonal influenza vaccination had significantly higher antibodies to the avian H4, H5, H6, and H8 subtypes; and that participants with exposure to poultry had significantly higher antibody responses to the H7 subtype, but to none of the other subtypes tested. Exposure to other types of birds did not play a role in immunity.

A person's immune response on the ELISA test did not necessarily predict response on the HAI test, and vice versa. As HAI antibodies only target the "head" of the HA while ELISA antibodies can be against the head or the relatively conserved "stalk" domain, this result indicated that some individuals were more likely to target the conserved stalk region (i.e. show greater reactivity in ELISA than in HAI).

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