Time-dependent viral interference between influenza virus and coronavirus in the infection of differ

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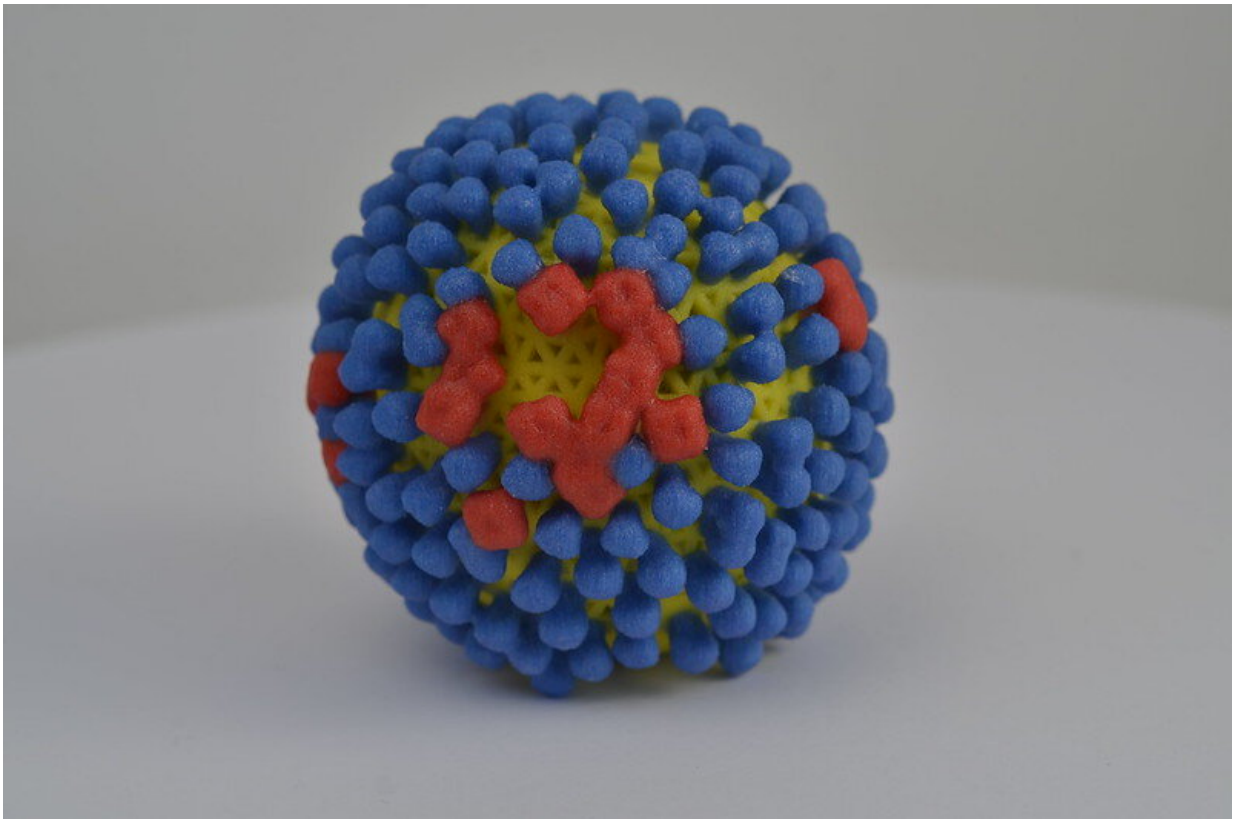

3D print of influenza virus. The virus surface (yellow) is covered with proteins called hemagglutinin (blue) and neuraminidase (red) that enable the virus to enter and infect human cells. Credit: NIH

A new study carried out in pig cells suggests previous infection with swine influenza virus (SIV) can protect against the development of porcine respiratory coronavirus (PRCoV) if there is a zero- or three-day interval between infections.

The findings, published in the peer-reviewed journal *Virulence*, may also be relevant to influenza and coronavirus infection in humans.

Ju-Yi Peng of the University of Veterinary Medicine Hannover and colleagues used air liquid interface cultures of cells taken from pigs' windpipes to investigate the interactions between the two viruses.

They found that prior infection by swine influenza virus completely inhibited coronavirus infection when the cells were infected on the same day or three days apart. By contrast, infecting cells with coronavirus then swine influenza virus had little effect on the replication of swine influenza virus.

"Taken together, the timing and order of virus infection were important determinants," the authors said. "Prior infection by SIV induced an innate immune response which prevented PRCoV from replicating. However, prior infection by PRCoV only partially inhibited SIV infection."

This difference may be explained—at least in part—by the difference in the range of cells each of the two viruses can infect. Influenza viruses are very efficient in infecting ciliated cells, which are the majority of cells in the lining of the windpipe. These cells have tiny hair-like structures—cilia—on their surface which sweep mucus and bacteria up to the back of the throat where it can be swallowed. PRCoV prefers non-ciliated, non-mucus-producing cells so it infects a lower number of cells and as a consequence induces a weaker immune response.

The study's findings about how coronavirus and influenza virus interact when infecting the airway may also be relevant to humans. The development of these viruses in pigs and humans shares many aspects, and PRCoV and SIV infection in porcine models has been used to mimic coronavirus and influenza virus infection in humans.

Thus, the results could have implications for potential co-infections by SARS-CoV-2 and seasonal influenza viruses. "At the epidemiological level, a seasonal peak incidence of influenza virus infection may delay the expected peak incidence of human coronavirus and other respiratory viruses infection," the authors said. "It will be interesting to find out whether the current seasonal influenza viruses interfere with this coronavirus and delay or prevent infection."

More information: Ju-Yi Peng et al, Time-dependent viral interference between influenza virus and coronavirus in the infection of differentiated porcine airway epithelial cells, *Virulence* (2021). DOI: 10.1080/21505594.2021.1911148

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