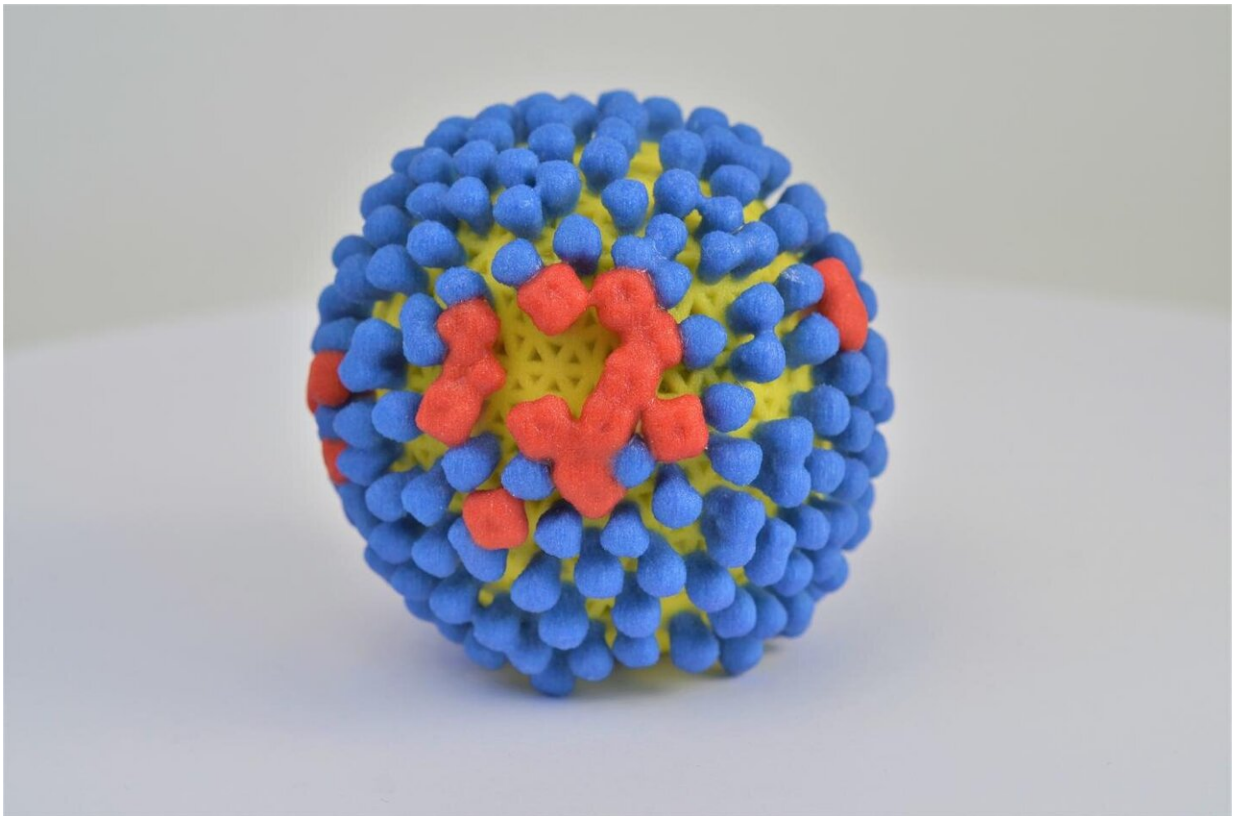


Cold infections may be less frequent in people with the flu

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Influenza viruses, like the model shown here, display several kinds of surface proteins on their exteriors. Credit: NIAID

People were less likely to catch either influenza or a common cold-causing rhinovirus if they were already infected with the other virus, a

new study by scientists from the Medical Research Council-University of Glasgow Centre for Virus Research has found.

Understanding how these distinct viruses inhibit each other could help [public health](#) planning to improve forecasting models that predict respiratory disease outbreaks and strategies for controlling disease spread, say the scientists.

It has been observed before that common cold infections appear to be less frequent in the influenza season and vice versa. The new study, published in the journal *Proceedings of the National Academy of Sciences*, is the first study with enough samples to provide strong evidence for this interaction at both the population and individual level.

Samples from 44,230 cases of acute respiratory illness, in 36,157 patients, were tested for 11 types of respiratory viruses over nine years in NHS Greater Glasgow and Clyde. Using this data, the researchers found that 35% tested positive for a [virus](#) and, of those, 8% were co-infected with more than one type of virus.

The most striking interaction they found was between influenza A viruses and rhinoviruses, a type of virus that can cause the common cold. Computer modelling of the data found that the inhibitory interactions between influenza and rhinoviruses appeared to occur within individual people as well as at a population level.

Patients with influenza A were approximately 70% less likely to also be infected with rhinovirus, than were patients infected with the other virus types.

Dr. Sema Nickbakhsh, from the MRC-University of Glasgow Centre for Virus Research at the University of Glasgow, who was first author on the paper, said: "One really striking pattern in our data is the decline in cases

of the respiratory virus rhinovirus, which is typically a mild common cold causing virus, occurring during winter, around the time that flu activity increases."

"In the same way as lions and spotted hyenas compete for food resources in the Masai Mara, we believe respiratory viruses may be competing for resources in the respiratory tract. There are various possibilities we're investigating, such as these viruses are competing for cells to infect in the body, or the immune response to one virus makes it harder for another unrelated virus to infect the same person."

Viruses from the same species—for example different strains of influenza—could be expected to compete or generate an overlapping [immune response](#) in the body, but the researchers say what makes these findings interesting is the interaction is between completely different types of viruses.

Dr. Pablo Murcia, from the MRC-University of Glasgow Centre for Virus Research at the University of Glasgow, who led the research, said: "Traditionally people have studied viruses in isolation—you study only flu or rhinovirus—but we've shown here that we need to also be studying these viruses together like it's an ecosystem. My team are now doing experiments to try and understand how respiratory viruses, including influenza and rhinovirus, interact. If we understand how viruses interact and how certain viral infections may favour or inhibit each other, then maybe we can develop better ways to target viruses."

"Studying interactions between viruses could help to explain why different viruses circulate in different seasons or why they affect different age groups, and within the body why certain types of viruses infect different parts of the respiratory tract, like the nose or the lungs."

An example of how these viruses could also affect each other's spread at

a population level, include that if a person is infected with one virus they're more likely to stay home and consequently not catch another virus.

Limitations of the study include that the correlations observed cannot show what is causing these interactions and that samples were only taken from people with symptoms of a respiratory infection, so it may not capture how the viruses behave in people who don't develop symptoms.

Dr. Nickbakhsh added: "A key thing to note with this research is that we're looking at average risks over a very large number of patients who have sought healthcare—that's not to say that occasionally unlucky individuals can't be infected with influenza and a cold virus at the same time."

The study looked at how 11 viruses interacted. It did find relationships between some of the other virus pairs, but these were not consistent at both the individual host and population level, which the study did find for [influenza A](#) and rhinovirus.

More information: Sema Nickbakhsh et al., "Virus–virus interactions impact the population dynamics of influenza and the common cold," *PNAS* (2019). www.pnas.org/cgi/doi/10.1073/pnas.1911083116

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