Insights into how a bird flu virus spreads could prevent pandemics

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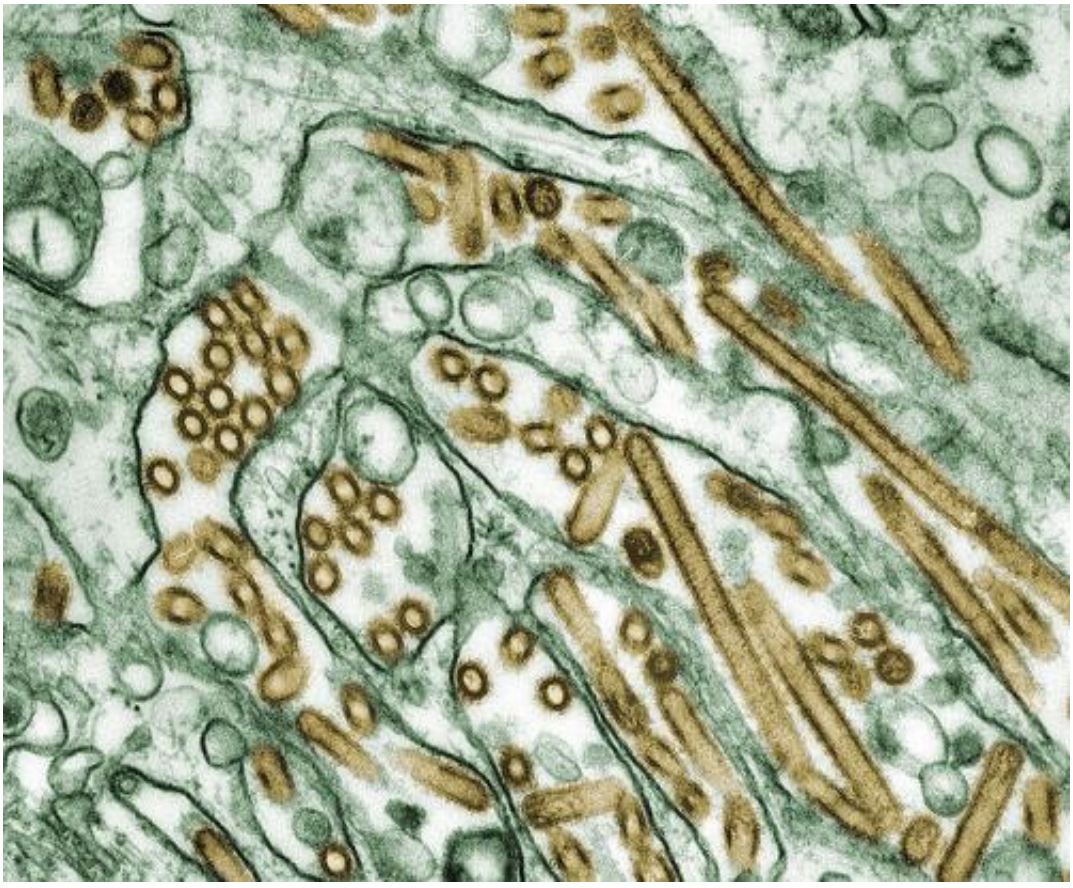

Colorized transmission electron micrograph of Avian influenza A H5N1 viruses (seen in gold) grown in MDCK cells (seen in green). Credit: Cynthia Goldsmith/CDC

The H5N1 bird flu virus has infected and killed hundreds of people,

despite the fact that, at the moment, the virus can't spread easily between people. The death toll could become much worse if the virus became airborne. A study published by Cell Press April 10th in the journal *Cell* has revealed a minimal set of mutations allowing H5N1 to be transmitted through the air from one ferret to another. The findings will be invaluable for future surveillance programs and may provide early warning signals of the emergence of potential pandemic strains.

"By gaining fundamental knowledge about how the influenza virus adapts to mammals and becomes airborne, we may ultimately be able to identify viruses that pose a public health risk among the large number of influenza viruses that are circulating in animals," says senior study author Ron Fouchier of Erasmus Medical Center. "If we can do this, we might be able to prevent some pandemics in the future."

The H5N1 virus has caused serious outbreaks in domestic poultry in Asia and the Middle East and has infected people in 15 countries. The virus must be transmissible through air for a pandemic to occur, and Fouchier and his colleagues previously identified several H5N1 mutations linked to airborne transmission through aerosol or respiratory droplets. But, until now, the minimal set of mutations required for airborne transmission was not clear, hindering the ability of scientists to predict and prepare for pandemics.

In the new study, the researchers identified five mutations that are sufficient for airborne transmission of H5N1 between ferrets—one of the best models of influenza transmissibility available today. Two mutations improved the binding of the virus to cells in the upper respiratory tract of mammals; two other mutations enabled the virus to replicate more efficiently; and the remaining mutation increased the stability of the virus.

"This type of analysis provides a more complete picture of the changes

that may constitute increased risk of H5N1 transmissibility," says Peter Palese of the Icahn School of Medicine at Mount Sinai, who coauthored an Essay accompanying the research paper. "Assessment of how adaptations in ferrets affect viral fitness, virulence, and transmission is sorely needed in order to gain a truly holistic perspective of the likelihood that these viruses might cause a pandemic and what characteristics such a pandemic might exhibit."

More information: *Cell*, Linster et al.: "Identification, Characterization, and Natural Selection of Mutations Driving Airborne Transmission of A/H5N1 virus." dx.doi.org/10.1016/j.cell.2014.02.040

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