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Virus hybridization could create pandemic bird flu

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Genetic interactions between avian H5N1 influenza and human seasonal influenza viruses have the potential to create hybrid strains combining the virulence of bird flu with the pandemic ability of H1N1, according to a new study.

In laboratory experiments in mice, a single gene segment from a human seasonal flu virus, H3N2, was able to convert the avian H5N1 virus into a highly pathogenic form. The findings are reported the week of Feb. 22 in the online early edition of the Proceedings of the National Academy of Sciences.

"Some hybrids between H5N1 virus and seasonal influenza viruses were more pathogenic than the original H5N1 viruses. That is worrisome," says Yoshihiro Kawaoka, a virologist at the University of Wisconsin-Madison and senior author of the new study.

The H5N1 bird flu virus has spread worldwide through bird populations and has caused 442 confirmed human cases and 262 deaths, according to the World Health Organization. To date, however, bird flu has not been able to spread effectively between people.

"H5N1 virus has never acquired the ability to transmit among humans, which is why we haven't had a pandemic. The worry is that the pandemic H1N1 virus may provide that nature in the background of this highly pathogenic H5N1 virus," says Kawaoka, a professor of pathobiological sciences at the UW-Madison School of Veterinary Medicine.

Two viruses infecting a single host cell can swap genetic material, or reassort, creating hybrid strains with characteristics of each parent virus.

Before the current study, hybrid viruses generated in lab studies had always been less virulent than parent strains. However, the new findings raise concerns that H5N1 and pandemic H1N1 viruses could reassort in individuals exposed to both viruses and generate an influenza strain that is both highly virulent and contagious.

The increased virulence seen in the new study seems to arise from one of the eight genes in the viral genome, called PB2, which is known to affect how well the bird flu virus grows in mammalian hosts, including humans. When tested in mice, the human virus version of PB2 swapped into H5N1 converted the avian virus to a highly pathogenic form.

The researchers say surveillance of viral populations is critical to monitor the potential emergence of highly pathogenic viral variants due to reassortment of avian and human influenza viruses. Their results, including identification of the PB2 segment as a key to enhanced virulence, offer information likely to be useful in the event of a pandemic caused by a hybrid avian-human influenza strain.

"With the new pandemic H1N1 virus, people sort of forgot about H5N1 avian influenza. But the reality is that H5N1 avian virus is still out there," Kawaoka says. "Our data suggests that it is possible there may be reassortment between H5 and pandemic H1N1 that can create a more pathogenic H5N1 virus."

Provided by University of Wisconsin-Madison