H5N1 virus with genes from H1N1 can spread through the air between mammals

Supported by the National Science Fund for Distinguished Young Scholars, a team of scientists led by Prof. Chen Hualan in the Harbin Veterinary Research Institute of Chinese Academy of Agricultural Sciences found that the H5N1 influenza viruses will be transmissible among mammals if they derive certain genes from the widely circulating human H1N1 influenza viruses, and their paper entitled "H5N1 hybrid viruses bearing 2009/H1N1 virus genes transmit in guinea pigs by respiratory droplet" was published in *Science* (**2013**, 340(1459): 1459—1463).

H5N1 has caused massive outbreaks in poultry and wild birds in Asia, Africa, and Europe since 2003. More than 600 people have also become infected-and more than half of them died. But in almost all cases, their infection was due to contact with sick birds. H5N1 does not transmit efficiently from person to person. If it develops a way to do so, a pandemic would be virtually inevitable. The H5N1 and 2009 pandemic H1N1 (2009/H1N1) viruses overlap both in their geographical range and in the species they infect, their hybrids can arise naturally when a person or an animal is infected with both strains. Therefore, it is important to known whether H5N1 will become pandemic by picking up certain genes from 2009/H1N1.

To answer this question, Chen's team mixed and matched seven gene segments from H5N1 and 2009/H1N1 in every possible combination, to create 127 reassortant viruses, all with H5N1's HA gene. They gauged whether these composite viruses would transmit between guinea pigs that didn't have direct contact but were housed in adjoining cages, a common setup to test whether a virus can be spread by respiratory droplets through the air. They found some of these hybrids could spread through the air between guinea pigs in adjacent cages, as long as they carried either or both of two genes from H1N1 called PA and NS. Two further genes from H1N1, NA and M, promoted airborne transmission to a lesser extent, and another, the NP gene, did so in combination with PA.

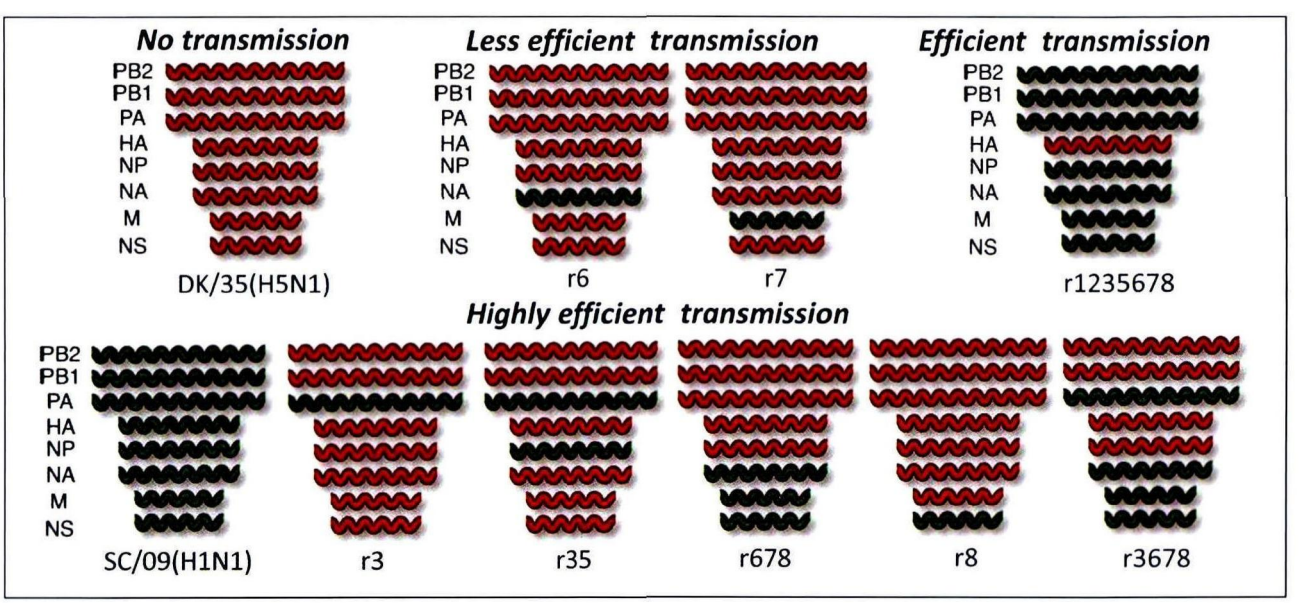

Figure Transmission efficiency of the H5N1 resaaortants and their parents H5N1 and 2009/H1N1 viruses. In the virus name, "r" denotes "reassortant". The numbers in the virus name indicate the segments derived from SC/09(H1N1) virus as follows: 1, PB2; 2, PB1; 3, PA; 5, NP; 6, NA; 7, M; and 8, NS.