

A transdisciplinary study of the risk of transmission and spread of HPAIV H5N1 in Asian intensive agro-ecosystems

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Agricultural intensification in South China has increased densities of domestic ducks raised on paddy fields, an important factor of the persistence of H5N1 highly pathogenic avian influenza virus (HPAIV) persistence. Some major wild bird congregation wetlands in South China have been partly turned into paddy fields where millions of free-grazing domestic ducks are raised. This may facilitate the contact and the circulation of HPAIV between human, poultry and wild waterbirds. In this transdisciplinary study, we combined epidemiological, ecological, agricultural and virological data to evaluate the potential transmission of HPAIV between domestic and wild ducks in intensive agro-ecosystems. We used new technologies such as satellite tracking of Wild birds, GPS tracking of domestic ducks, remote sensing of irrigated paddy fields, and phylogenetic analysis of H5N1 strains isolated in wild and domestic birds. Our results show: (i) a temporal correspondence between the period of presence of free-grazing domestic ducks and wild ducks in harvested paddy fields, (ii) a spatio-temporal correspondence at the local scale between habitats used by domestic and wild ducks, and at the regional scale between wild ducks migration and H5N1 outbreaks, and (iii) a genetic correspondence between H5N1 HPAIV strains isolated from poultry and the environment in South China intensive agro-ecosystems and strains isolated from wild birds and poultry in South Korea, Russia and Japan outbreaks. By bringing together elements from different fields, this transdisciplinary study demonstrates the role of interface that South China intensive agro-ecosystems may play in the emergence, persistence, and regional spread of H5N1 HPAIV.

