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Scientists Report Improvements In Predicting Avian Bird Flu

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DURHAM, N.H. — In a paper published today in the Proceedings of the National Academy of Sciences (PNAS), modeling results of highly pathogenic avian influenza (HPAI) subtype H5N1 outbreaks in Southeast Asia suggest improved ways to predict where outbreaks will most likely occur. This would have significant implications for disease surveillance, risk management, and policymaking.

The study, detailed in the paper entitled “Mapping H5N1 highly pathogenic avian influenza risk in Southeast Asia” and co-authored by University of New Hampshire (UNH) scientist Xiangming Xiao, looked at how different risk factors contributed to the virus's spread, including the numbers of ducks, geese, and chickens; human population size; rice cultivation; and local topography. The results suggest that, of this mix, people, ducks, and rice farming intensity are the dominant risk factors in determining the distribution of H5N1 outbreaks in Southeast Asia.

Paddy rice farming in monsoon Southeast Asia varies substantially over space and time. This poses a great challenge to gathering data about agricultural land use, in particular, the cropping intensity and crop calendar. To address this, the research team employs advanced satellite remote sensing technology to map and track the spatial distribution and temporal dynamics of paddy rice using images from the Moderate Resolution Imaging Spectroradiometer (MODIS) sensor, part of NASA’s Earth Observing System (eospso.gsfc.nasa.gov).

Says Xiao, of the UNH Institute for the Study of Earth, Oceans, and Space (EOS), “In Southeast Asia, double- and triple- paddy rice cultivation in a year is often associated with free-grazing ducks. Our results show that monitoring free-grazing duck populations and tracking paddy rice farming by satellite are the most important and effective ways of predicting H5N1 outbreaks distribution.”

These latest findings reported in the paper are the results from multi-year research projects by an international team of interdisciplinary (e.g., animal health, epidemiology, environmental remote sensing) scientists, including researchers from UNH, the Universite Libre de Bruxells, Brussels, Belgium, and the Food and Agriculture Organization (FAO) of the United Nations. The research projects are funded by the FAO/UN and the U.S. National Institutes of Health Fogarty International Center as part of the NIH/NSF Ecology of Infectious Disease Program.

Says Joshua Rosenthal of the Fogarty International Center at NIH, “Given the potentially global scale of H5N1 Influenza, predictive tools, such as these being developed by this research team, are an important part of our growing capability to focus local surveillance and

interventions to manage risks of disease outbreaks in humans and on farms.

Adds Xiao, “Satellite-based Earth observations provide rich information on the dynamics of ecosystems and landscapes, and assimilation of Earth observation, in-situ surveillance data, and models offer powerful tools for our society to better understand the ecology and epidemiology of animal-borne infectious diseases.”

The paper can be read on the PNAS Early Edition site at http://www.pnas.org/papbyrecent.shtml.