Emerging infectious diseases pose a significant burden on human and animal health and global economies. Conventional approaches to epidemic control have most often been reactive. However, explosive human population growth, dramatic changes in land use, and increased global trade and travel require a shift toward a proactive, predictive approach. The PREDICT project aims to prevent, detect, and rapidly respond to the spillover of novel infectious pathogens from wildlife to humans.

While the linkage of human, animal, and environmental health is at the heart of our One Health approach – an increasingly important and recognized lens through which governments, NGOs, and practitioners view public health – the global health community still has three critically important needs:

1) Broader and deeper knowledge of pathogens with the potential to emerge from animals;
2) Targeted surveillance to maximize available resources;
3) Tools to characterize organisms that could be pathogens of significance and to predict where and how they might spillover to susceptible hosts.

**Challenge:** Develop a strategic framework to identify pathogens of pandemic potential that have not yet emerged.

**Opportunity:** Current infrastructure improvements and technological advances have dramatically and rapidly improved our ability to identify high-risk interfaces for disease transmission and to detect novel pathogens before widespread spillover occurs. These advances include improvements in information technology, molecular diagnostics, and risk modeling.

PREDICT has built a broad coalition of partners to discover, detect, and monitor pathogens at the wildlife-human interface using a risk-based approach. Our efforts integrate digital sensing and on-the-ground surveillance at critical points for disease emergence. PREDICT is at the cutting-edge of recent technological advances allowing rapid detection and diagnosis of high-risk viral families, even in settings where resources are limited.
The goal of the PREDICT project in China was to discover zoonotic and new potential pathogens of pandemic risk and to strengthen surveillance on wildlife species and people involved in live animal markets and farms where human-animal contact rates are potentially high. PREDICT-China was a collaborative effort between EcoHealth Alliance and East China Normal University, Wuhan Institute of Virology, and the Guangdong Provincial Center for Disease Control and Prevention.

Background

PREDICT has increased capacity for a One Health response to outbreaks in China. The PREDICT project has linked partners in government and academia to enhance surveillance in high-risk human and key animal populations as well as conduct hospital-based syndromic surveillance for fevers of unknown origin. Results of PREDICT work in China have highlighted areas where people and wildlife come into contact, and novel viruses have been identified that have the potential to spill over from wildlife into people. Partnership with provincial Centers for Disease Control has ensured that information gained from animal surveillance activities has been communicated to the necessary public health officials. PREDICT has strengthened the network of agencies conducting human and animal disease surveillance, which has enhanced China’s ability to identify and respond to outbreaks of novel viruses.

Disease Surveillance

- Surveillance activities conducted in 19 provinces and cities like Beijing and Shanghai.
- **Over 3,061 bats, 737 rodents and shrews, and 146 other animals were sampled** in animal markets, farms, and rural areas.
- Samples collected from more than 1,300 individuals in high-risk human populations.
- Behavioral surveys of farmers, market, and restaurant workers, and local residents were conducted.

Disease Outbreak Response

- Enhanced surveillance and laboratory analysis capabilities
- Guangdong One Health Avian Influenza H7N9 Task Force
- Developed an Animal Market risk assessment index/model
Capacity Building
- Developed an integrated surveillance system.
- Implemented standardized testing algorithm and protocols for viral detection.
- Increased testing capacity at collaborating laboratories in Shanghai, Hubei, Yunnan, and Guangdong provinces.
- Comparative analysis of WHO and PREDICT Avian Influenza protocols.

Partnerships for Sustainability
- East China Normal University
- Wuhan Institute of Virology
- Yunnan Institute of Endemic Diseases Control & Prevention
- Guangdong Institute of Public Health
- Centers for Disease Control and Prevention of Guangdong Province
- Shanghai Center for Disease Control and Prevention
- Guangxi Normal University
- Nanning Museum of Natural History
- Guangdong Entomological Institute
- Institute for Molecular Ecology and Evolution

Expanding the One Health framework for surveillance
- First ever isolation of a SARS-like CoV from bats with the potential to directly infect humans.
- Discovered high prevalence of SARS-like CoV in bats, a high diversity of new viruses from different viral families (including coronaviruses), and some bats with multiple strains of these new viruses, which all indicate that there is a wide diversity of potentially zoonotic viruses present in bats in China that could spillover directly into people and cause another SARS-like outbreak.
- Optimized PREDICT surveillance protocols by developing an animal field guide and via field and lab trainings for collaborating institutions and individuals.
- Guangdong Hospital syndromic surveillance study of people with encephalitis and hemorrhagic fevers of unknown origin.
- Enhanced laboratory analysis for H7N9 and tested for Influenza virus in 2,249 samples from people with Influenza like illness; 3,651 environment samples; and 330 bird samples.

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PREDICT characterized zoonotic disease risks at critical animal-human interfaces in China.


