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 that have 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 for identifying 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.
PREDICT-Bangladesh used a collaborative One Health framework to identify novel wildlife viruses that potentially pose a significant public health threat. This collaborative effort included EcoHealth Alliance; International Diarrheal Disease Research, Bangladesh (icddr,b); the Institute for Epidemiology, Disease Control and Research (IEDCR); and the Bangladesh Forest Department.

Background

Bangladesh provides a unique opportunity for human, domestic animal, and wildlife interaction due to the high density of people co-occurring with rich biodiversity in a country that depends on both human and animal labor to drive agriculture and intensive livestock production. The high density of people and livestock in highly fragmented landscapes forces wildlife to live among villages and that coupled with strong seasonal variation in water availability increases the risk of zoonotic threats and may facilitate transmission of viruses of pandemic potential. Bangladesh has experienced the emergence of avian influenza and Nipah virus, providing impetus for the government and its partners to develop a One Health approach to disease surveillance.

Disease Surveillance

PREDICT surveillance consisted of the targeted nonlethal capture and sampling of bats, rodents, and primates (taxonomic groups highly associated with zoonotic viruses). We are sampling these key mammalian species for novel viral agents at high risk interfaces, including wildlife-human and wildlife-domestic animal interfaces at urban, rural, peri-urban, and pristine areas with wildlife hunting.

Disease Outbreak Response

Bangladesh has experienced repeated outbreaks of zoonotic diseases including Nipah virus and avian influenza and as a result, the Government of Bangladesh has developed a sophisticated One Health approach to zoonotic disease outbreak response. PREDICT staff have supported local implementing partners icddr,b and the Ministry of Health (IEDCR) during outbreaks by conducting wildlife sampling and training Forestry Office staff in the safe collection of wildlife samples during an outbreak.
Capacity Building

- Trained the Forestry Department’s veterinary staff, in collaboration with icddr,b, to conduct disease surveillance in wildlife, outbreak investigation, and epidemiology.
- PREDICT Bangladesh also facilitated training through the EcoHealthNet program that is currently conducting additional training of Forest Department veterinarians and biologists.
- PREDICT trained over 20 individuals in wildlife surveillance and diagnostics.
- Engaged Bangladesh Forest Department, Department Livestock Services and Department of Health & Family Welfare (IEDCR), and Chittagong Veterinary and Animal Sciences University in surveillance and training.
- Introduced a novel diagnostic approach utilizing consensus (genus/family level) polymerase chain reaction (PCR) at the icddr,b laboratory using controls, protocols, and primers developed by PREDICT.

Partnerships

- International Diarrheal Disease Research, Bangladesh (icddr,b)
- Institute for Epidemiology, Disease Control, and Research (IEDCR)
- Bangladesh Forest Department
- Bangladesh Livestock Department


