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 Mexico was to strengthen surveillance and diagnostics in order to understand the ecology and the relationship between zoonotic pathogens and their hosts. PREDICT-Mexico was a collaborative effort between the National Autonomous University of Mexico and EcoHealth Alliance.

Background

Population growth and land conversion for agricultural use have negatively affected species diversity and ecosystem services. A highly biodiverse country, like Mexico, provides a unique opportunity to understand complex relationships between biodiversity and infectious diseases. The transdisciplinary PREDICT team focused on the effect that human disturbance has on the interconnections among pathogens and hosts.

Background

- PREDICT conducted wildlife surveillance in pristine and adjacent disturbed (agricultural) areas to investigate interfaces of potential human-animal contact around two important Biosphere Reserves as well as within Mexico City, one of the most populated cities of the world.
- **2,028 animals were sampled:** 1,981 bats, 41 rodents, and 6 marsupials.
- **23 new viruses were discovered** including: coronaviruses, adenoviruses, astroviruses, herpesvirus and pegiviruses.

Top: Team members with children of the community.
Bottom: Bat captured for sampling prior to release.
Photos by A. Menchac.

Disease Surveillance

PhD student Rafael Ojeda training in the lab at the Columbia University. Photo by S. Anthony.
Partnerships for Sustainability

- Faculty of Veterinary Medicine, UNAM
- Institute of Ecology, UNAM
- Ministry of Environment and Natural Resource (SEMARNAT)
- Ministry of Agriculture, Livestock, Rural Development and Fishery (SAGARPA)
- Ministry of National Animal Health (CONASA)
- Conservation Medicine Laboratory of the School of Medicine at Mexico's National Polytechnic Institute (IPN)

Biologists and veterinarians were trained in PREDICT wildlife sampling methods.

PREDICT Mexico brought the Departments of Health, Environment and Agriculture together to discuss a One Health framework.

The Department of Agriculture developed a new committee position for wildlife health, and appointed the PREDICT co-country coordinator.

Trained two PhD and several Masters students, including laboratory training at Columbia University.

Using One Health Approach

Expanded the One Health framework for surveillance:

- Stimulated cross-ministry discussions and worked with SAGARPA to include wildlife health as an important topic.
- Trained 45 personnel in wildlife sampling and testing methods.
- Organized three International One Health conferences.

Improved surveillance and evaluating hotspots:

- Used standardized methods to ensure proper collection of data and samples at high-risk interfaces.
- Developed surveillance system designed to understand the impact of human disturbance on biodiversity as well as viral diversity.
- Introduced innovative techniques for testing viral families at the IPN laboratory, by using synthetic DNA controls and broadly reactive consensus PCR assays to detect zoonotic viruses.
- Two papers have been published and three are in preparation.

Capacity Building

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- Trained two PhD and several Masters students, including laboratory training at Columbia University.

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Selected PREDICT Publications 2012-2014


