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 Bolivia was to develop local capacity to detect, prevent, and respond to zoonotic disease outbreaks of wildlife origin, through strategic partnerships with government and scientific institutions. PREDICT-Bolivia was a collaborative effort among the Wildlife Conservation Society, EcoHealth Alliance, the Bolivian Bat Conservation Program, and the Institute of Molecular Biology and Biotechnology (IBMB; University Mayor of San Andres).

Background

More than 60% of infectious diseases are shared between humans and animals and 70% of these originate in wildlife. One Health approaches recognize that activities and conditions of humans, animals, and the environment affect each other.

The Amazon rainforest has been dramatically modified in recent decades through human activity. In Bolivia, deforestation for agriculture and logging, bushmeat hunting, and illegal wildlife trade are significant and expanding. Disturbance of natural habitats increases opportunities for contact between wildlife, disease vectors, and people and therefore is associated with higher risk of zoonotic disease emergence.

Disease Surveillance

Wildlife pathogens were detected and monitored in priority taxonomic groups (bats, primates, and rodents) at seven high-risk animal-human interfaces: subsistence hunting (indigenous territories), wildlife trade, captive settings (sanctuaries), disease outbreaks, peri-domestic settings in and around human dwellings (near villages or urban areas), extractive industries (logging), and livestock agriculture.

PREDICT standardized methods to ensure proper collection of information and samples across these interfaces. Field teams sampled 289 rodents, 751 bats, and 142 nonhuman primates.

Left: Chemical restraint and blood sampling of peri-urban rodents during an outbreak of Arenavirus hemorrhagic fever, Beni. Photo by E. Alandia.

Making a Difference for One Health

Expanding the National Task Force for Zoonoses Surveillance:

PREDICT stimulated a cross-ministry initiative to develop a National Zoonoses Surveillance Plan with the Ministry of Health and Sports (MSyD), Bolivian Veterinary Service (SENASAG), General Directorate of Biodiversity and Protected Areas (DGBAP), and Pan American Health Organization (PAHO). PREDICT trained 156 government personnel, health professionals, veterinarians and biologists, lab technicians, indigenous hunters, and other collaborators in wildlife sampling and testing methods.

Enhancing Surveillance and Response:

PREDICT helped identify and respond to a yellow fever outbreak in 2012 after five dead howler monkeys were found near a wildlife sanctuary in eastern Bolivia. Post-mortem examinations were performed at the Municipal Zoo, La Paz, and PCR testing revealed they were infected by a flavivirus. The Ministry of Health and Sports was immediately notified. Sequencing confirmed infection by two yellow fever viral strains, both related to human cases in Trinidad & Tobago and Brazil.

Only eight days passed between the onset of outbreak and notification of government partners. Preventive measures were promptly implemented in the area, including vaccination campaigns, public outreach and mosquito control. Thanks in part to this rapid response, no human cases occurred during the outbreak. The event reinforced alliances between the Bolivian government, USAID, PAHO Bolivia, and other outbreak response partners.

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Disclaimer: All activities reported here were conducted prior to April 30, 2013.


