USAID FROM THE AMERICAN PEOPLE | PREDICT

A Project of USAID's Emerging Pandemic Threats Program

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:

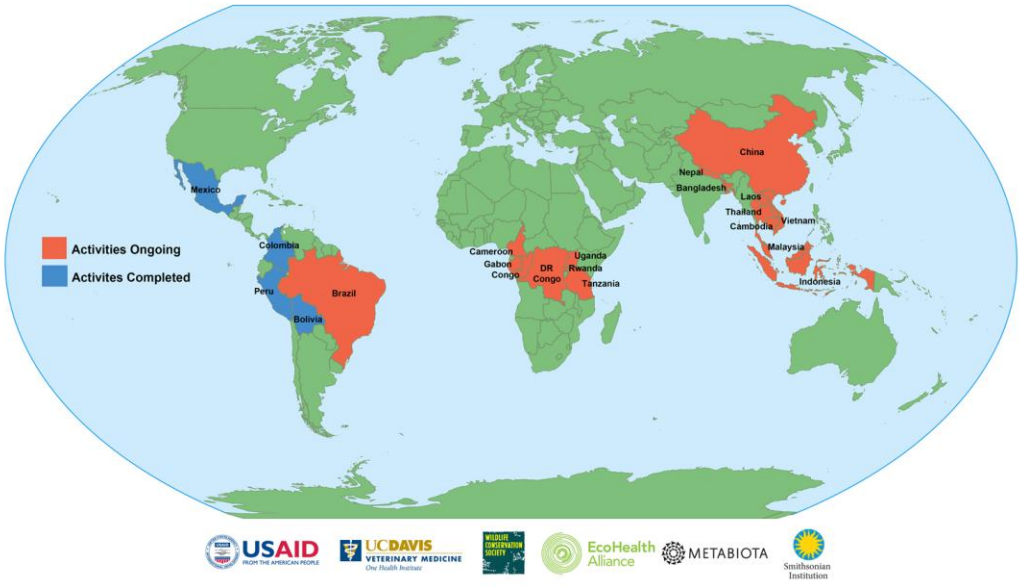
1) Broader and deeper knowledge of pathogens with the potential to emerge from animals;
2) Targeted surveillance to maximize available resources;
3) Tools to characterize organisms that could be pathogens of significance and to predict where and how they might spillover to susceptible hosts.

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.**

PREDICT Countries



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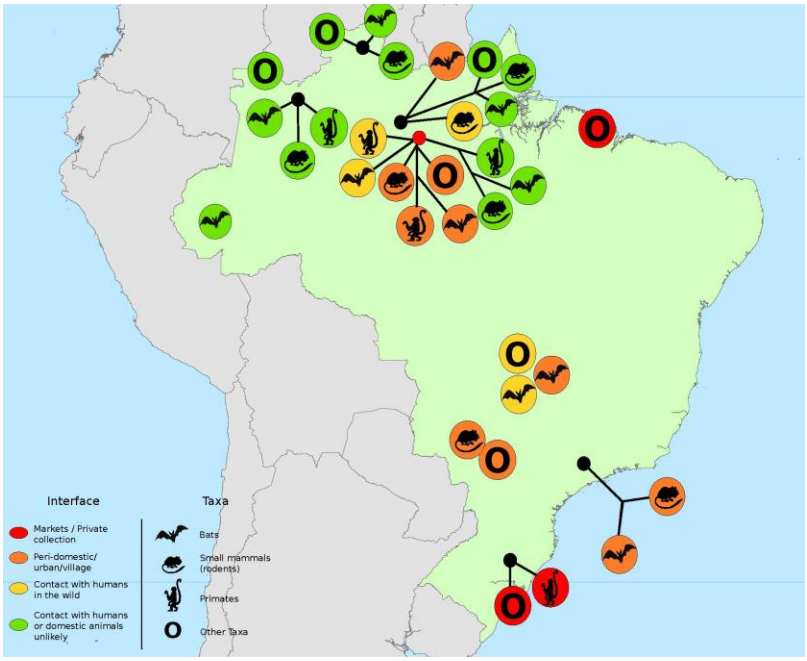
PREDICT – BRAZIL

The goal of PREDICT in Brazil is to understand the ecological effects of disturbing forests on the health of people, wildlife, and pathogens: a collaborative effort between EcoHealth Alliance, Wildlife Conservation Society, University of São Paulo (USP), and Columbia University.



PREDICT characterizes zoonotic disease risks at critical animal-human interfaces in Brazil.

Background

- Brazil hosts 15-20% of the world's plant and animal diversity and the largest number of endemic species.
- Brazil has one of the largest and fastest growing economies, which can lead to deforestation, road building and other environmental transformations.
- Land use change is one of the major drivers of disease emergence. Several outbreaks of zoonotic diseases of wildlife origin have been documented in Brazil associated with human encroachment into previously pristine areas.
- PREDICT is applying a uniquely standardized One Health approach to address ecological factors and understand human behaviors that drive zoonotic disease emergence.

Disease Surveillance

Wildlife disease surveillance (capture, sampling, and release of wildlife) in Brazil has focused on four mammal groups: rodents, marsupials, bats, and primates. PREDICT surveillance was conducted across the country, including areas deep in the Amazon at several wildlife-human interfaces. Brazil was chosen from among the 20 PREDICT countries to be one of three that participate in the PREDICT Deep Forest project which focuses on a disturbance gradient to provide a rigorous scientific understanding of how land-use change affects biodiversity and the viral diversity the wildlife carry. For this study, PREDICT developed a standardized methodology to sample three types of land-use: pristine forest and semi-disturbed and highly disturbed/urban landscapes.

Deep Forest Brazilian Team. *Photo @ M. Solorio.*

Sampling bats at night in the Amazon. *Photo @ K. Murray.*

PREDICT team working in all weather. *Photo @ J. Kueneman.*

A bat ready to be sampled. *Photo @ K. Murray.*

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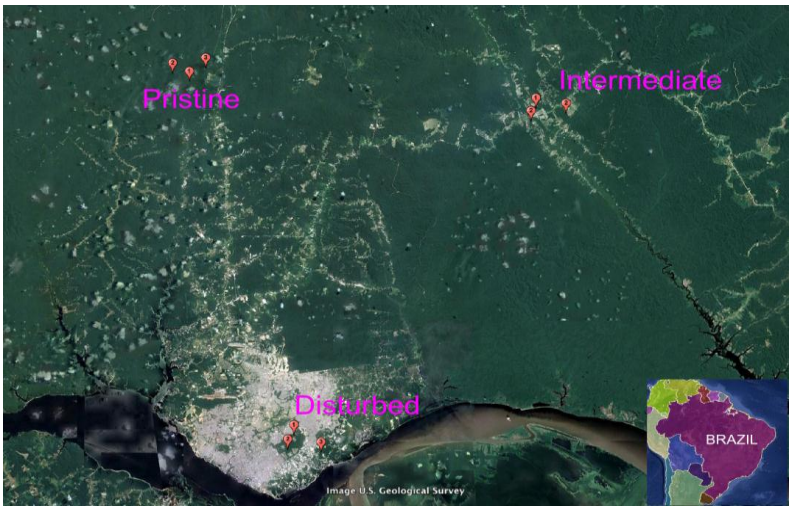
EcoHealth Alliance | ICB USP | WILDLIFE CONSERVATION SOCIETY



Satellite image of the PREDICT Deep Forest sites in Amazonas State, Brazil. The disturbed sites are located in Manaus City. The intermediate sites are in the Rio Preto da Eva Municipality, a region occupied by rural villages and indigenous people. The pristine sites are near the BR-174 Highway, an area protected by Universidad Federal do Amazonas.

Capacity Building

Expanding the One Health workforce in Brazil:

- Trained more than 57 individuals in wildlife surveillance.
- Promoted the One Health concept to stimulate the scientific community and promote inter-organization cooperation in wildlife disease surveillance.
- Strengthened relations between Brazilian citizen stakeholders and government representatives.
- A multidisciplinary team of wildlife researchers (biologists, ecologists, and veterinarians) was built, creating a network across the country, in a variety of ecosystems, to conduct wildlife disease surveillance.

Partnerships for Sustainability

- Federal University of Amazonas (UFAM)
- National Research Institute of Amazonia (INPA, Manaus)
- Laboratory of Epidemiology and Biostatiscs, USP
- Laboratory of Comparative Pathology of Wildlife, USP
- Institute "Chico Mendes" of Conservation and Biodiversity
- Sauim de Coleira Project, UFAM

More information at: http://www.vetmed.ucdavis.edu/ohi/predict/

Project Successes

Optimized national capacity for zoonotic disease surveillance:

- In total PREDICT has sampled 1,659 animals, yielding 9,094 diagnostic samples. This includes 1,192 bats, 109 rodents, 66 non-human primates, 159 birds, and 133 animals in other taxonomic groups.
- The PREDICT Deep Forest Project was successfully implemented and the results will be used to better understand the potential risk of disease spillover from wildlife to humans.
- A population of endangered pied tamarins, the primary PREDICT monkey species, was threatened by road construction through one of the urban fragments. The PREDICT team, local scientists and the surrounding neighborhood joined together to bring this to public attention and stop the construction.

Improved USP laboratory capacity:

- Improved specimen organization through the use of barcode labels.
- Funded the training of one Brazilian postdoctoral fellow at Columbia University.
- Provided an automated DNA/RNA extraction machine, increasing laboratory efficiency.
- Introduced PCR protocols and positive controls to conduct consensus PCR for 19 viral families, genre and species of potential zoonotic importance.

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Selected PREDICT Publications 2012-2014

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