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.**
The goal of the PREDICT project in the Democratic Republic of Congo (DRC) was to assist the DRC Government in establishing a disease surveillance system for early warning of human and animal disease outbreaks. PREDICT-DRC was a collaborative effort between Metabiota, Institut National de Recherche Biomedicale (INRB), Kinshasa School of Public Health, Ministry of Environment – Institut Congolais pour la Conservation de la Nature (ICCN), and the Ministry of Health – Direction of Disease Surveillance.

Background

Most major human infectious diseases come from animals, including human monkeypox virus and viral hemorrhagic fevers (e.g. Ebola). In DRC, anthropogenic and demographic changes, as well as mass human population displacements, have increased contact between humans and wild animals, increasing the risk for spillover of infectious diseases from animals to humans. A One Health approach, which is the integrated effort of multiple disciplines to optimize the health of people, animals, and the environment, presents the greatest potential for prevention and control of these diseases.

Disease Surveillance

In DRC, PREDICT implemented a regional network for detection of infectious diseases at the human wildlife interface. The field teams have sampled greater than 3,000 wild animals (bats, rodents, nonhuman primates, and other species of hunted animals) in areas where there is high potential for spillover of viruses from wildlife to humans, including hunting areas, bushmeat markets, and sanctuaries.

The field teams involved the community in disease surveillance activities. People who are hunting wild animals for food are sensitized to the risk of zoonotic disease exposure and trained to collect samples from hunted animals for pathogen testing.

PREDICT sampled ill persons presenting to health care facilities and persons working in wildlife sanctuaries and zoos that have close contact with animals and are suspected to have zoonotic infections.

PREDICT conducted infectious disease surveillance in wildlife at multiple sites in DRC.

Bushmeat is an important source of animal protein for people in DRC, and some rely on it for their livelihood.

Left: A PREDICT field worker obtains permission from a hunter to collect samples from hunted monkeys. Photo by Maria Makuwa.

Right: Hunter carries a hunter-killed bat to be sold as bushmeat. Photo by Ipos Ngay.
Partnerships for Sustainability

Improved Capacity

- Developed advanced molecular disease diagnostic laboratory at the National Institute for Biomedical Research and implemented a novel diagnostic approach that rapidly detects both known and unknown viruses via an inexpensive polymerase chain reaction (PCR) assay.
- Improved the cold chain for disease surveillance by supplying a liquid nitrogen generating plant.
- Provided personal protection training to community members and hunters in order to reduce their risk of infection during hunting and butchering activities.
- Trained staff from regional health zones, zoos, sanctuaries, and parks on the recognition and prevention of zoonoses.

Active Surveillance and Outbreak Response:

- Engaged government and NGO staff in training and development of outbreak response and sampling protocols for wildlife.
- Assisted with the investigation and response to an outbreak of EMCV in bonobos in a sanctuary in Kinshasa. PREDICT identified the cause of the outbreak, mobilized teams of veterinarians to provide care to the sick bonobos, collected samples from sanctuary workers to test for infection, and assisted government officials with control and prevention measures.
- Contributed to the Ebola outbreak response in Isiro by assisting and training staff from the ministries of Agriculture and Environment and NGO partners in sample collection from bats, rodents, and non-human primates in the area surrounding the outbreak.
- Discovered a new pathogen (Bas-Congo virus) associated with hemorrhagic disease in people.
- Identified Chikungunya virus as the cause of an outbreak in Kinshasa.
- Characterized divergent Zaire Ebola Virus strains in DRC.
- Documented re-emergence of Crimean-Congo Hemorrhagic Fever Virus in Central Africa.
- Facilitated shipment and testing of samples from infected cows in the Nord-Kivu Province, Masisi District to the Ministry of Agriculture Central Veterinary Laboratory, where *Brucella abortus* was diagnosed. Brucellosis is a disease of economic importance in cattle in DRC.

Contact:
Prime M. Mulembakani, MD, MPH
Institut National de Recherche Biomedicale (INRB)
Avenue de la Democratie, B.P. 1197, Kinshasa/Gombe
Tel. +243 (0)81 013 8305 - +243 (0)99 340 4083
pmulembakani@metabiota.com
Kinshasa, D. R. Congo
More information available at:


