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 Republic of Congo (RoC) is to strengthen wildlife disease surveillance and diagnostics for zoonotic pathogens in wildlife. PREDICT-RoC is a collaborative effort among the Ministry of Defense of the Republic of Congo, the Veterinary Diagnostic Laboratory of Brazzaville, the National Public Health Laboratory, Global Viral, and the Wildlife Conservation Society.

Background

More than 60% of infectious diseases are shared between animals and humans, 70% originating in wildlife. Anthropogenic activities, including logging and wildlife consumption, are driving disease emergence. The Republic of Congo is an Ebola virus endemic region. Ebola virus disease (EVD) epidemics in the region have been linked to wildlife consumption. Human population growth, extractive industry and economic and infrastructure development combine to increase the likelihood of Ebola virus and other pathogen spillover from animals to people.

Disease Surveillance

PREDICT prioritized disease surveillance in areas where contact between humans and wildlife is most intense, and thus where disease spillover is most likely to occur.

Surveillance teams sampled primarily free-ranging bats and rodents, as well as wildlife hunted for human consumption. Efforts were focused primarily on remote regions, in villages where wildlife destined for urban markets originate.

Disease Outbreak Response

In June 2010, PREDICT staff were alerted to a cluster of human deaths in northern Congo and relayed the report to the Ministry of Health. As public health authorities investigated the deaths, PREDICT performed six forest surveys to determine if wildlife had also been affected, as human Ebola virus disease outbreaks are often preceded by animal die-offs caused by Ebola virus. This joint effort illustrates how PREDICT used an interdisciplinary approach to help investigate the source of infection with the aim of preventing further spread.

Training of Congolese veterinarians on safe wildlife capture, handling, and sampling. Photo by Global Viral.
Partnerships for Sustainability

- Le Laboratoire de la Santé Publique, Ministère de la Santé
- La Ministère de Défense Nationale
- Laboratoire Diagnostic Vétérinaire de Brazzaville
- Les Grands Endémies, Ministère de la Santé
- Ministère de l’Environnement, d’Eaux et le Développement Durable
- Ministère de la Recherche Scientifique et Technologique
- Virus Ecology Unit, Laboratory of Virology, Rocky Mountain Laboratories, NIAID/NIH
- Special Pathogens Branch, Public Health Agency of Canada
- Mining Projects Development (MPD) Congo S.A.

Capacity Building

- Developed local capacity to safely conduct wildlife pathogen surveillance through field-based training of biologists and researchers.
- Trained staff of the National Public Health Laboratory and Veterinary Diagnostic Laboratory of Brazzaville in safe handling and molecular diagnostic testing of wildlife specimens.
- Established viral family testing protocols with the National Public Health Laboratory in Brazzaville.

Making a difference for One Health

Expanding National Capacity for Wildlife Pathogen Surveillance

- Trained around 50 national biologists on safe collection of wildlife samples.
- Conducted wildlife surveillance in both free-ranging wildlife populations and at high-risk human/wildlife interfaces, including local hunters, extractive industry sites and in and around human dwellings.
- Collected 9,187 specimens from 1,575 animals, including 539 bats, 352 nonhuman primates, and 317 rodents and shrews.
- Undertook polymerase chain reaction (PCR) screening of 1,075 samples from 58 species of animals for 25 viral families/genera including Adeno-, Alpha-, Arena-, Astro-, Boca-, Bunya-, Corona-, Entero-, Filo-, Flavi-, Hanta-, Henipa-, Herpes-, Influenza-, Lyssa-, Nipah-, Orbi-, Orthopox-, Paramyx-, Phlebo-, Retrovirus- lentivirus genus, Rhabdo-, and Seadorna and Simian Foamy.

Developing Effective Outbreak Response

- Worked with the Congolese Ministry of Health and World Health Organization to coordinate response to a human mortality event in an Ebola-endemic region.
- Demonstrated to partners, that interdisciplinary cooperation in outbreak response can be accomplished by conducting rapid and effective wildlife surveillance in response to a human disease outbreak.
- Contributed to the development of the national Ebola Virus Disease Outbreak Response Plan.

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Dr. Nina presents the research team to the people of Gombe Carrefour. Dr. Nina works at the Laboratoire Diagnostic Vétérinaire de Brazzaville with PREDICT. Photo by Emmanuel Ngongang.


