SUPPORTING GLOBAL HEALTH SECURITY WITH ECOSYSTEM RESEARCH

Shifting from a Reactive to a Proactive Paradigm

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Emerging and Re-emerging Infectious Disease Events

Hantavirus Pulmonary Syndrome, 1993
MERS, 2012
Nipah encephalitis, 1998
SARS, 2003
Bolivian Hemorrhagic Fever, 1963
Ebola, 1976

Animal sources and human activities underlying spilllover come to light well after disease emergence is detected in humans
Ecology Of Disease Emergence

75% of emerging infectious diseases in people have wildlife origins
Data provided by WHO Report of the Review Committee on the Functioning of the IHR Regulations in relation to Pandemic (H1N1) 2009.
Ebola outbreaks
To January 14th 2016
Number of people infected:
- Guinea: 2,536
- Sierra Leone: 14,122
- Liberia: 10,675
- Nigeria: 66,49
- Mali: 86
- Senegal: 1

Number of people infected per 100,000 population:
- Liberia: 11,315
- Sierra Leone: 208
- Guinea: 3,955

Sources: WHO; UN; The Economist
*Includes cases in Italy, Spain, Britain and the United States. Excludes Congo
Advancing Epidemic Detection and Response

Detection in animals
Detection in humans
Response

First case in humans
Risk of a Pandemic Threat

Evolution of viruses in animal hosts

Cross-species transmission

Spread by human to human transmission

Ecological change driving these processes
Forces of Global Change

- Population growth
  - Increased 90 million/year at end of last century
- Economic Development
  - Industrialization
  - Agricultural development
  - Rapid urbanization
Direct and indirect contact transmission from wildlife to people
The Challenge

• Earlier detection of zoonotic diseases where they are most likely to emerge
• Improved characterization of risk at the animal-human interface
USAID’s Emerging Pandemic Threats Program

Coordinated One Health Surveillance Strategy

Concurrent sampling of wildlife, livestock, and people

Identify viruses shared by diverse animal species and people

Investigations between outbreaks must be implemented by local partners
USAID’s Emerging Pandemic Threats Program

Standardized One Health Testing Strategy

Multi-valent testing platform across wildlife, livestock, and people

- Filoviruses (Ebola, Marburg)
- Influenzaviruses (Flu)
- Coronaviruses (MERS, SARS)
- Flaviviruses (YFV, Zika)
- Paramyxoviruses (Nipah, Hendra), Arena, Bunya, Rhabdo, Retro, . . . . .

- Consensus PCR
- Next generation sequencing for unbiased detection and to further characterize novel viruses
The PREDICT CONSORTIUM