Emerging Risks to Animal Health

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Why do we care?

- Global issue
- Zoonotic implications
- Uncertain consequences of a new disease
- Unknown pathways for disease transmission
  - Vectors
  - Movement
  - Wildlife-livestock interface
Emerging Infectious Diseases

Wildlife

Domestic Animals

Humans

Translocation

Encroachment
Introduction
"Spill over" & "Spill back"

Agricultural
Intensification

Technology
and Industry

Human
encroachment
Ex situ contact
Ecological
manipulation

Global travel
Urbanization
Biomedical
manipulation

Dasazak P. et.al.
Science 2000 287:443
What do we want?

To provide timely information to stakeholders.

- Global awareness, assessment and preparedness
- Emerging risk events detected, identified and characterized
- Emerging risk findings communicated
- Quick response undertaken to minimize the impact of emerging risk events
How Are We Doing?

“While it has been possible to eradicate certain infectious diseases (smallpox and veterinary disease rinderpest), and to significantly control many others..., it seems unlikely that we will eliminate most emerging infectious diseases in the foreseeable future.”

- Morens and Fauci, PLOS Pathogens, 2013

“Indeed, our war on emerging pathogens may never end. War on emerging pathogens is intensifying in 2013.”

Emerging Disease - Globally

- Middle East Respiratory Syndrome Corona virus (MERS-CoV)
- Orthopoxvirus (Georgia)
- Teschen Disease (Haiti)
- *New avian influenza*:  
  - H7N9 (*low pathogenic* (China))
  - H5N8 *Highly pathogenic* (South Korea)
- Hendra Virus (Australia)
- Re-emergence of Ebola  
  - Largest known outbreak in humans (west Africa)
- Antimicrobial resistance  
  - Multi-resistant staphylococcus aureus
- Nipah virus (Bangladesh)
- Severe fever with thrombocytopenia syndrome
- Schmallenberg virus – affecting cattle, sheep and goats
Emerging Disease - Domestically

- Chikungunya
- Dengue
- H1N1
- Swine Enteric Coronavirus Diseases (nSECD)
How can we address the issue?

• Detection Methods and Information Sources
  – Passive Surveillance
  – Active Surveillance
  – Information Sources
    • Internet
    • Databases
  – Direct Collaboration with Stakeholders
  – Collaboration with Partners
Products

- Watch List
- Informational Notices
- Assessments
- Pathway Analysis
- Economic Assessments
- Risk Analysis
- Etc.
Resources

• Staff
• Expertise
• Telephone contact
• Travel
• Cooperative agreements
• Partnerships
• Development of information systems
• + others
Measurable Outcomes

- Timely recognition and reporting
- Cooperative assessments
- Sharing of information
Hot Spots for Emerging Diseases

Map shows an analysis of the future likelihood of infectious diseases originating in wildlife that have the potential to infect humans.

**West Nile virus**  A mosquito-borne illness that causes symptoms in about a fifth of those exposed. One in 150 becomes severely ill with encephalitis.
- **ANIMAL RESERVOIR**: Various birds, especially crows in the U.S.
- **FIRST HUMAN CASE**: West Nile district of Uganda, 1937; first U.S. case was in Queens in 1999.
- **WHT**: International air travel.
- **SUSCEPTIBLE HOSTS**: Humans, birds, especially crows, horses.

**SARS**  A severe viral respiratory infection that quickly spread from China to more than two dozen countries. The outbreak was contained, and since 2004 no new cases have been reported.
- **ANIMAL RESERVOIR**: Horseshoe bats.
- **FIRST HUMAN CASE**: Guangdong Province, China, 2003.
- **WHT**: Wildlife markets and travel.
- **SUSCEPTIBLE HOSTS**: Humans, civets.

**Bird flu**  A deadly strain of the avian influenza virus called H5N1 has spread to humans via contact with live or dead poultry.
- **ANIMAL RESERVOIR**: Wild waterfowl.
- **FIRST HUMAN CASE**: Hong Kong, 1997; it re-emerged widely in 2002 and 2004.
- **WHT**: Global expansion of intensive poultry farming; contact with infected birds.
- **SUSCEPTIBLE HOSTS**: Humans, poultry, cats.

**H1N1 influenza**  A strain of H1N1, commonly called swine flu, killed thousands and infected millions in 2009. Humans in turn spread the disease to pigs, triggering a pandemic in livestock.
- **ANIMAL RESERVOIR**: Waterfowl and pigs.
- **FIRST HUMAN CASE**: Veracruz, Mexico, 2009; first U.S. case was in San Diego in 2009.
- **WHT**: Livestock production (pigs and poultry); contact with wild waterfowl.
- **SUSCEPTIBLE HOSTS**: Humans, pigs.

**Ebola**  This hemorrhagic fever is among the most virulent known diseases. There is no specific treatment or vaccine available; patients must be strictly isolated.
- **ANIMAL RESERVOIR**: Various bats.
- **FIRST HUMAN CASE**: Yambuku region, Zaire (now Democratic Republic of Congo), 1976.
- **WHT**: Contact with or eating infected wildlife, especially gorillas.
- **SUSCEPTIBLE HOSTS**: Humans, chimpanzees, gorillas, duikers, small African antelopes.

**Nipah virus**  A highly lethal pathogen for which there is no cure or vaccine. Humans-to-human transmission has been documented; nearly annual outbreaks in Bangladesh since 2001 and two in India.
- **ANIMAL RESERVOIR**: Fruit bats (above).
- **FIRST HUMAN CASE**: Sungai Nikoi, Negri Sembilan, Malaysia, 1999.
- **WHT**: Large-scale livestock production; presence of orchards on pig farms; date palm sap harvest (spoiled contaminated sap is a significant cause of infection).
- **SUSCEPTIBLE HOSTS**: Humans, pigs, horses, dogs, cats.

**Hendra virus**  A close relative of the Nipah virus, it has killed four people and dozens of horses in Australia.
- **ANIMAL RESERVOIR**: Fruit bats.
- **FIRST HUMAN CASE**: Hendra, a suburb of Brisbane, Australia, 1994.
- **WHT**: Livestock encounter of wild habitats.
- **SUSCEPTIBLE HOSTS**: Humans, horses, dogs.
“No one person, no one alliance, no one nation, no one of us is as smart as all of us thinking together.”

- James Stavridis

“The secret is to gang up on the problem, rather than each other.”

- Thomas Stallkamp