How Can Academia Contibute to Moving the “One Health” Concept Forward?

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One Health Networking Event
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The Next 30 Minutes

- Set the agenda for today’s discussion
  - Provide perspective about the term “One Health”
  - Talk about challenges to implementing a One Health approach (case examples)
  - Update what USG and academia are currently doing
  - Identify gaps that academia can fill
“One Health”

- **Old**
- **New**

**Increasingly popular term**
- Not used consistently or uniformly
- Isn’t One Health just business-as-usual?
- Is One Health the same as good public health?
Evolution of the One Health Movement in the United States

- **1992**
  - IOM Forum on Emerging Diseases (CDC and NIAID)

- **1994**
  - PulseNet and FoodNet

- **2004**
  - WCS and Columbia U → One World One Health™

- **NGOs**
  - 2008 OH Initiative, 2009 OH Commission
  - WCS, EcoHealth Alliance

- **USG Agencies**
  - CDC (2009), USDA (2012), NPS (2012) form OH Offices/Entities

- **Donors**
  - USAID EPT1 and 2, BMG

- **Academia**
  - Conferences, seminars, courses, degree programs
One Health is an approach to solving health problems that acknowledges the overlap of different sectors.
One Health: From Concept To Action
A healthy individual
doesn’t exist in isolation.
We are all part of larger communities.
We are all part of larger communities.
We all have different interactions
with different types of animals.
with different types of animals.
Some of our animals live close together,
and we live close to our animals.
Wildlife habitats are disappearing
and the climate is changing.
Global trade is easy,
and global travel is fast,
giving previously isolated outbreaks pandemic potential.
The environment,
The environment, animals
The environment, animals, and people
overlap.
And new diseases emerge.

Morbidity and Mortality Weekly Report (MMWR)

Emergence of Avian Influenza A(H7N9) Virus Causing Severe Human Illness — China, February–April 2013

Photo Credit: http://guardianlv.com/2013/06/mers-coronavirus

Photo Credit: http://www.glts.net/school-resources/health/h1n1-q-a.html
Our efforts to secure a safe, adequate food and water supply,
our efforts to protect the environment,
and our efforts to prevent, detect and control infectious diseases
Environmental Health must overlap as well.
One Health In Action

- Foster collaborative relationships between human health, animal health and environmental health partners
- Improve communication between sectors
- Coordinate disease surveillance activities
- Develop uniform messaging to the public

Environmental Health

Wildlife Health

Human Health

Animal Health
One Health

It’s time to turn the concept into action.
One Health
What can you do?
Visit:
http://www.cdc.gov/onehealth
Human Travel: Global Air Traffic

Source: http://www.openflights.org/demo/openflights-routedb-2048.png
Maritime Traffic of Animals and Products
Changing Demographics

- Urbanization and human crowding
  - From 13% urban in 1900 to 60% in 2030
Redefined Animal-Human Interfaces
Inter-Oceanic Highway, Peru
Emerging Zoonotic Disease outbreak alert and response

- Animal outbreak
- Human outbreak

First cases in Animals

Climate Vegetation Environment

Animal Amplification

Delayed Response

Late Detection

Control Opportunity

Number of Cases

0 10 20 30 40 50 60 70 80 90

TIME

Epidemic and Pandemic Alert and Response
Emerging Zoonotic Disease outbreak alert and response

1. Forecasting Readiness
2. Early detection Animal & Human cases
3. Rapid Response
Challenges to Implementing a One Health Approach

- Case example: Q Fever
- Case example: Rift Valley Fever
Case Study: Q Fever in the Netherlands
Q Fever: Background

- Infrequently reported bacterial zoonoses (*Coxiella burnetii*)
- Causes minor disease in animals (mostly sheep and goats) although can result in abortions and stillbirths
- Aborted goat placentas can distribute billions of microbes into the environment
- Human illness usually manifests as acute febrile illness with pneumonia and/or hepatitis
- Category ‘B’ bioterrorism agent
Increase in Human Reports of Q Fever Following Expansion of Dairy Goat Farming

- >2,300 human cases, 6 deaths

Source: SCIENCE; 327 Jan 2010
Different Perspectives

- **Human Health**
  - Vets didn’t report soon enough
  - Economic interests trumped human health
  - Problem was increased high-intensity dairy goat farming
  - Massive culling was essential

- **Animal Health**
  - Most animals were healthy
  - Increase in human cases was due to better Dx tests and surveillance
  - Vaccines were available and would control the epidemic among goats
  - Massive culling was unnecessary
“Grisly job. A vet injects marked pregnant goats with a sedative during a mass culling operation at a Dutch farm.”

Source SCIENCE 15 January 2010
Outcome

- All pregnant goats (>60,000) on affected farms were destroyed and lifetime ban imposed on breeding goats on premises
- Vaccination campaign initiated in 2008, with full coverage by end of 2009
- *C. burnetii* persists in the environment for unknown length of time
- Role of cattle and sheep farms still undefined
How could this situation have been different if a One Health approach had been used?

- Enhanced surveillance among animals for diseases that can impact human health
- Integrated surveillance communication channels that notify counterparts when disease incidence changes
- Effective vaccination strategies for animal diseases that affect humans
- Respectful and timely communication rather than over-reaction
Case Study

RIFT VALLEY FEVER (RVF)

Past, present and future
RVF: Background

- Virus transmitted by mosquitoes
- Discovered in 1930
- Multiple outbreaks, primarily Africa and Middle East
- People may also be infected by contact with blood and tissue of infected animals
- Most infected people show no signs of disease
- Severe disease occurs in both humans and animals
- Many animals (sheep, goats, cattle, camels)miscarry and many die.
How do we protect people?

3 possible intervention points:

1. Vaccinate people
2. Eliminate mosquitoes
3. Vaccinate animals
Vaccinate animals

- Prevent animal illness, prevent virus amplification and thus prevent subsequent human infections

- But existing vaccines all have problems
Window of Opportunity for One Health Approach

- New vaccines for animals have been developed and are being successfully field tested
- Environmental forecasting can predict virus emergence
- Animals could be vaccinated BEFORE human disease occurs

This could be a true One Health success story
Challenges

- **Communication**
  - Between environmental scientists and the human and animal sectors
    - Between public health and agriculture

- **Funding**
  - Who pays for vaccinations for animals primarily to protect human health?

- **Authorities and jurisdictions**
  - Different sectors have different mandates
Current Status of One Health: USG Agencies

- **Federal Inter-Agency One Health Working Group**
  - Multiple Agencies, quarterly calls

- **Department of Defense**
  - Defense Threat Reduction Agency (DTRA)

- **USAID**
  - EPT-2

- **CDC**
  - Website
  - International Assignees
  - FELTP
One Health Activities at CDC
National Center for Emerging and Zoonotic Infectious Diseases

“Our work is guided in part by a holistic ‘One Health’ strategy, which recognizes the vital interconnectedness of microbes and the environment. Through a comprehensive approach involving many scientific disciplines, we can attain better health for humans and animals and improve our environment.”

http://www.cdc.gov/ncezid/
The One Health concept recognizes that the health of humans is connected to the health of animals and the environment. CDC uses a One Health approach by working with physicians, ecologists, and veterinarians to monitor and control public health threats. We do this by learning about how diseases spread among people, animals, and the environment.
One Health Global Activities

Food and Agriculture Organization of the United Nations

World Organisation for Animal Health

Centers for Disease Control and Prevention

World Health Organization

Guatemala

Democratic Republic of the Congo

Egypt

India

Kenya

Uganda

Thailand

South Africa

Georgia

Kazakhstan

China

Bangladesh

Vietnam
Field Epidemiology Training Programs

- 2-year applied epidemiology training program
- Modeled after CDC’s Epidemic Intelligence Service
- ~25% class work / 75% field assignment
- Graduates may receive a certificate or degree
- CDC has supported the development and implementation of 49 FETPs since 1980, 16 of which are now operating independently. As of January 2013, CDC supports 21 two-year FETPs that cover 33 countries
CDC-supported FETPs as of December 2013
## Current Status of One Health: Academia

<table>
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<th>University</th>
<th>Courses</th>
<th>Program/Degrees</th>
<th>Program Home</th>
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<tr>
<td>UC Davis</td>
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<td>OH Institute</td>
<td>Vet School</td>
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<td>U of Wash</td>
<td>X</td>
<td>PhD, MHS</td>
<td>Env/Occ Health Sci</td>
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<td>BS Pgm, Prof Cert</td>
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# Current Status of One Health: Academia—cont

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<td>School for Global Animal Health</td>
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<td>Western U/OR State</td>
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<td>Collaborative</td>
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Barriers and Challenges
For Both Academia and Government

- Inertia
- Lines of communication between disciplines not well established
- Organizational mandates perhaps too focused
- Professionals trained to be specialists rather than generalists
- Lack of cross-cutting funding
- Perception that professional respect is lacking
In Order to Move the One Health Approach Forward We Must Build Bridges

- Communication before crises
- Agency, Ministry and University level endorsements
- Coordinated surveillance, laboratory and response
- Professional work force trained to implement an inter-sectoral/trans-disciplinary approach
Gaps That Are Best Addressed By Academia

• Provide/require inter-disciplinary training

• Foster and build an environment that generates inter-disciplinary trust among both students and faculty

• Include non-traditional colleagues in funding applications
One Health: definitely progress but at a crossroad
Thank You
Thomas Kuhn

*The Structure of Scientific Revolution, 1962*