22AB: One Health & Health Security

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Lecture Overview

• Motivation
• One Health foundations
• Stakeholder approaches
• Case studies
• Health Security
• Preparedness
• Disaster & Outbreak Response

“Poppy”
Why learn about One Health?

- One Health is a required CEPH competency
- One Health approaches aid in systems thinking
- One Health requires multidisciplinary teams
- One Health knowledge is foundational to outbreak response

Swine flu outbreak among attendees exposed to pigs at a Michigan fair.
Class Exercise 2

Median/Mode: 0 pets

Outlier: 55
2018 v 2019 cohort pet ownership

- Sum of dognum
- Sum of catnum
- Sum of ppnum
- Sum of herpnum
- Sum of birdnum
- Sum of otherpetnum
Cat owners: 12.1%
2018 cohort: 10.5%
U.S. Average: 30-35%

Dog owners: 14.8%
2018 cohort: 11.6%
U.S. Average: 35-45%

Other pets: 3.3%
2018 cohort: 2.7%
FDA warns of pet owners using animals to get opioids

By Jacqueline Howard, CNN
Updated 4:55 AM ET, Thu August 16, 2018

The Opioid Epidemic: What Veterinarians Need to Know

The epidemic of opioid abuse is affecting medical and health professionals such as physicians and pharmacists, but also veterinarians.
California Police Rush to Save Animals From Fires: ‘Get In, Get In. That’s a Good Dog.’

Police officers in Vacaville, Calif., rescued animals from an S.P.C.A. on Aug. 11 as a wildfire was approaching. The fire was contained the following day and all the animals were saved and placed in foster homes, the police said. Aug. 14, 2018

Source: NY Times
Minamata (水俣病) Disease, 1950s

Chisso Corporation in Minamata, Japan
- Production of fertilizers and acetaldehyde
- Methylmercury was a byproduct of catalytic reaction used to produce acetaldehyde
- Discharged into Minamata Bay

“Dancing cat disease”
- Cats that ate fish from Minamata Bay showed neurologic signs

Epidemic of neurologic signs in people in the community who ate fish

Image source: BBC
Human-Animal Interface

Human Health

Animal Health

One Medicine
“...[I]mproved human health is the sole among veterinary medicine’s several benefits to society that arises from virtually all of veterinarians’ diverse activities...Therefore, if the considerable public and professional advantages of visualizing a major social focus for veterinary medicine en toto are to be realized, these underlying human health implications of its practice must become much better understood. To do this, people need to perceive that there is now and always has been only one medicine.”

- Calvin Schwabe

Veterinary Medicine and Human Health, 1984
A field guide to animal professionals in public health

• **Private practice veterinarians & associated professionals**
  – Control of zoonoses at the household level (*e.g.* roundworms)
  – Control of food-borne diseases at the farm level
  – Protection of health of human companions (mental health)

• **Public health veterinarians (*e.g.* state public health vet)**
  – Rabies control programs (state, federal, international)
  – Animal surveillance programs (*e.g.* ProMED)
  – Food and drug safety (*e.g.* FDA Center for Veterinary Medicine)
  – Bioterrorism & disaster preparedness (incl. military)

• **Animal control**
  – Rabies control programs (local, regional)
  – Animal population control (local, regional)
A field guide to animal professionals in public health II

• Department of Agriculture
  – Interstate and International movement of animals
  – Federal control programs for zoonotic diseases, e.g. bTB
  – Control of drug residues (food producing animals)
  – Bioterrorism & disaster preparedness

• Veterinary researchers & laboratory staff (e.g. CDC, academia)
  – Foreign animal disease research (threats to food supply)
  – Research in zoonotic & vector-borne diseases
  – Research in antimicrobial resistance
  – Research and outbreak investigation for foodborne diseases
  – Animal models for human disease (e.g. FIV & SIV to HIV)
  – Application of veterinary knowledge to human disease

One Health domains (or sectors)

(A) Studies or programs relating factors between animal and human health

(B) Studies or programs relating factors between environmental and human health

(C) Studies or programs relating factors between animal and environmental health

One Health is an exploding field of study

![Bar chart showing the increase in publications from 1927 to 2016.](chart.png)

- 2016: 435
- 2017: 570
- 2018: 685
- 2019...
  Already at **452**

What is One Health?

• **Conceptually?**

“[T]he collaborative effort of multiple disciplines — working locally, nationally, and globally — to attain optimal health for people, animals and our environment” – AVMA One Health Initiative Task Force

• **Methodologically?**

An approach to the conduct of multidisciplinary scientific research, government programs, or policy initiatives
  - Engagement of stakeholders
What are stakeholders?

“Stakeholders are people or organizations invested in the program, interested in the results of the evaluation, and/or with a stake in what will be done with the results of the evaluation.” – CDC

Typical stakeholders:

• People involved in research or program operations
• People affected by the research or program
• Decision-makers and funding sources

Adapted from CDC’s Program Performance and Evaluation Office
Why is engagement of stakeholders important?

“[E]volving concepts about health and its dependence on environmental resilience necessitate the inclusion of ministries, organisations [sic] and disciplines that may not have been traditionally considered to be related to health.”

– Jonna Mazet et al. 2014

(A few) Stakeholders in One Health

• Health departments / Ministries of health
  – U.S. example: CDC, state depts of health, local depts of health

• Departments of Agriculture
  – U.S. example: USDA, state depts of agriculture, academic extension services
  – Farmers & operators
  – Transportation (animal movement; import/export of animals & food)

• Drug development and safety (private and governmental)
  – U.S. example: FDA, private pharmaceutical companies, academia

• Research
  – U.S. example: veterinary, medical and other institutions; government agencies (intramural research)
  – Granting organizations: NIH, USDA, NGOs (extramural research)
One Health recognizes that the health of people is connected to the health of animals and the environment. The goal of One Health is to encourage the collaborative efforts of multiple disciplines-working locally, nationally, and globally-to achieve the best health for people, animals, and our environment.

A One Health approach is important because 6 out of every 10 infectious diseases in humans are spread from animals.
Governmental One Health Assessment Tools

Prioritizing Zoonoses: A Proposed One Health Tool for Collaborative Decision-Making

Cassidy Logan Rist 3, Carmen Sofia Arriola 9, Carol Rubin* 9
Centers for Disease Control and Prevention, Atlanta, Georgia, United States of America

An Assessment of Epidemiology Capacity in a One Health Team at the Provincial Level in Thailand

Soawapak Hinjoy 1,*, Arthicha Wongkumma 1, Somkid Kongyu 1, Punnarai Smithsuwan 1, Paphanij Suangtho 1, Thitipong Yingyong 1, Sunicha Chanvatik 2 and Soledad Colombe 3
Global applications

Piloting the One Health Systems Mapping and Analysis Resource Toolkit in Indonesia

Kaylee Myhre Errecaborde,1 Katharine M. Pelican,1 Heidi Kassenborg,1 Ong-Orn Prasarnphanich,1 Linda Valeri,1 Erinaldi Yuuzar,2 Rama Prima Syaht Fauzi,3 Nyoman Sri Budayanti,4 Agus Suwandono,5 Wayan T. Artama,6 Wiku Adisasmito,7 and Tracey Dutcher8

REVIEW ARTICLE

One Health capacity building in sub-Saharan Africa

Innocent B. Rwego, BVM, MSc, PhD1,7*, Olutayo Olajide Babalobi, DVM, MPVM, PhD2, Protus Musotsi, BSc3, Serge Nzietchueng, DVM, MSc1,4, Christian Keambo Tiambo, BSc, PhD5,6, John David Kabasa, BVM, MSc, PhD7, Irene Naigaga, BVM, MSc, PhD8, Gladys Kalema-Zikusoka, BVetMed, MRCVS9 and Katherine Pelican, DVM, PhD1
75% of all emerging infectious diseases are zoonotic.
What is infectious disease?

“An illness due to a specific infectious [communicable] agent or its toxic products that arises through transmission of that agent or its products from an infected person, animal, or reservoir to a susceptible host, either directly or indirectly through an intermediate plant or animal host, **vector**, or the inanimate environment.”

- Last, *Dictionary of Epidemiology*, 2001

**Vector**: organism (usually a biting insect) that transmits infectious agents from one host to another
The confusion over vectors

- Vector (organism)

Vector-Borne Diseases (VBD)
Malaria, Dengue, Chagas, etc.
The confusion over vectors

- Vector (organism)
- Vector (fomite)

Vehicle or mechanical vector

[Image source: Wikimedia]
The confusion over vectors

• Vector (organism)
• Vector (fomite)
• Vector (math)
Environmental Reservoirs

• An environmental reservoir is part of the abiotic (or inanimate) landscape that potentiates pathogen survival and transmission

• A “good” environmental reservoir
  – Pathogen “habitat” – pathogen can reproduce
  – Ecosystem
    • Pathogens & non-pathogens live together (microbiome)
    • Pathogen may acquire genes for fitness (e.g. antibiotic resistance: resistome)
Animal Reservoirs

• An **animal reservoir** is an animal (or insect) population that specifically maintains and perpetuates a disease
  – Pathogen “habitat” – pathogen can reproduce
  – e.g. birds and avian influenza

• Animals also may serve as transient or non-reservoir hosts (dead-end hosts)
  – May still help maintain disease
  – e.g. horses and West Nile virus
A “good” reservoir

• Reservoir host highly infected  
  – Viremia/bacteremia/parasite load high  
  – High level of pathogen shedding (discharge)

• Infectious disease does not cause morbidity (symptoms) or mortality (death) in reservoir host

• Reservoir host has a large, dense population

Adapted from *Dictionary of Veterinary Epidemiology, 1999*
Examples of animal reservoirs

- Rodents (rats and mice)
- Birds
- Bats
- Primates

Image source: CDC
Emerging Infections & Ecology

Fig. 1. The host-parasite ecological continuum (here parasites include viruses and parasitic prokaryotes). Most emerging diseases exist within a host and parasite continuum between wildlife, domestic animal, and human populations. Few diseases affect exclusively any one group, and the complex relations between host populations set the scene for disease emergence. Examples of EIDs that overlap these categories are canine distemper (domestic animals to wildlife), Lyme disease (wildlife to humans), cat scratch fever (domestic animals to humans) and rabies (all three categories). Arrows denote some of the key factors driving disease emergence.

Source: Daszak et al. Science
Example: Lyme Disease

- *Borrelia burgdorferi*  
  - Spirochete bacteria
- **Vector:** *Ixodes scapularis* (deer tick)
- **Reservoir host:** rodents  
  - *Peromyscus leucopus* (white-footed mice)
- **Amplifying host:** deer
- **Complex ecology!**
AMR AS A ONE HEALTH CASE STUDY
What are antimicrobials?

- **Chemicals** that kill or inhibit the growth of certain microbes (bacteria)
  - *Bacteriocidal*: antibiotics that work through killing bacteria
  - *Bacteriostatic*: antibiotics that work by hindering the reproduction (growth) of bacteria
What are antimicrobials?

• Chemicals that kill or inhibit the growth of certain microbes (bacteria)
• Antimicrobials can be found in nature
  • Often produced by fungi or other bacteria
  • May be important in inter-species competition or for communication among microbes
How do bacteria become resistant?

• **Mutation**
  - Mistake in replication or damage and repair of DNA produces genetic change
  - Change in genetic code produces resistance or proto-resistance gene

• **Horizontal Gene Transfer (HGT)**
  - Bacterium acquires resistance genes from donor

It was on a short-cut through the hospital kitchens that Albert was first approached by a member of the Antibiotic Resistance.
What is selective pressure?

Antibiotics in hosts and the environment expose bacterial populations, selecting for bacteria with resistance genes.
How does use of antimicrobials lead to resistance?

- **Resistome**: all the genetic determinants of resistance present in a community of organisms
  - Resistance may arise by mutation or by conjugation
  - Selective pressure expands the resistome
- Pathogenic and non-pathogenic bacteria
  - Even “good” bacteria can share genes for resistance
  - Bacterial communities important (microbiomes)
- Animal, human and environmental reservoirs
What is the resistome?

Why is antibiotic resistance a problem?

- ~2 million bacterial infections annually
- 90,000 deaths from these infections annually
- 70% are drug-resistant infections
- Drug-resistant infections cost more to treat and lead to longer hospital stays

* IDSA data
Reminder: Anatomy of an Industrial Hog Operation (ILO)

Image source: animalschange.org
Reminder: Worker and animal exposures

How much of U.S. antimicrobial use is in food animals?

• Food animal sales / distribution
  – 13.5 million kg *
  – 80% of all antimicrobial use (by weight)
  – 74% of this is non-therapeutic use

• Human use
  – 3.3 million kg *
  – 20% of all antimicrobial use (by weight)

* FDA data (2011)
FDA Summary of Antimicrobials Sold or Distributed for Use in Food-Producing Animals

Production for Domestic Distribution (kg)

- NIR
- Tetracyclines
- Sulfas
- Penicillins
- Macrolides
- Lincosamides
- Ionophores
- Fluoroquinolones
- Cephalosporins
- Amphenicols
- Aminoglycosides
How are antimicrobials used in food-producing animals?

• Therapeutic use for treatment of sick animals
  – Veterinary-Client-Patient Relationship (VCPR)
• Preventative uses in animals that are not sick but have been or may have been exposed to an infectious agent
• Uses for growth promotion or feed efficiency (“economic” or “production” uses)
  – “Growth promotion” (GPA) or “production use”
  – Est. 35-85% of U.S. antibiotic production (historically)
  – May include purchase and use outside of VCPR
Over-the-Counter (OTC) drug availability may vary by country
Pulsed-field Gel Electrophoresis (PFGE) Process

1. The scientist takes bacterial cells from an agar plate.

2. The scientist mixes bacterial cells with melted agarose and pours into a plug mold.

3. The bacterial cells are broken open with biochemicals, or lysed, so that the DNA is free in the agarose plugs.

4. The scientist loads the DNA gelatin plug into a gel, and places it in an electric field that separates DNA fragments according to their size.

5. The gel is stained so that DNA can be seen under ultraviolet (UV) light. A digital camera takes a photograph of the gel and stores the picture in the computer.

Image source: CDC
Use of molecular techniques in environmental & ID epi

• Tracking strains important for outbreak and other epi investigation
  – DNA “fingerprints”

• Techniques have evolved over time
  – CDC’s PulseNet (Pulsed-field gel electrophoresis)
  – Serotyping (E. coli, Salmonella) via agglutination methods
  – Genotyping (many microbes) by DNA/RNA methods

• Why so many techniques?
  – Whole Genome Sequencing (WGS) – gold standard
  – Less expensive methods for surveillance, research
Whole Genome Sequencing

The Whole Genome Sequencing (WGS) Process
WGS is a laboratory procedure that determines the order of bases in the genome of an organism in one process. WGS provides a very precise DNA fingerprint that can help link cases to one another allowing an outbreak to be detected and solved sooner.

1. DNA Extraction
   - Scientists take bacterial cells from an agar plate and treat them with chemicals that break them open, releasing the DNA.
   - The DNA is then purified.

2. DNA Shearing
   - DNA is cut into short fragments of known length, either by using enzymes “molecular scissors” or mechanical disruption.

3. DNA Library Preparation
   - Scientists make many copies of each DNA fragment using a process called polymerase chain reaction (PCR). The pool of fragments generated in a PCR machine is called a “DNA library.”

4. DNA Library Sequencing
   - The DNA library is loaded onto a sequencer. The combination of nucleotides (A, T, C, and G) making up each individual fragment of DNA is determined, and each result is called a “DNA read.”

5. DNA Sequence Analysis
   - The sequencer produces millions of DNA reads and specialized computer programs are used to put them together in the correct order like pieces of a jigsaw puzzle. When completed, the genome sequence containing millions of nucleotides (in one or a few large pieces) is ready for further analysis.

Image source: CDC
Example: WGS to inspect household MRSA transmission

Measure genetic “distance” using single-nucleotide polymorphisms (SNPs)

Index patient cluster
Dog cluster
Cluster 1
Cluster 2
Cluster 3

0.2 substitutions/site

Davis MF; Misic AM; Morris DO; Moss JT; Tolomeo P; Beiting D; Nachamkin I; and Lautenbach E; Rankin SC. Genome sequencing reveals strain dynamics of methicillin-resistant Staphylococcus aureus in the same household in the context of clinical disease in a person and a dog. Veterinary Microbiology 2015, 180(3-4):304-7.
Pathways for Resistant Bacteria

Case: Klebsiella from urinary infections and from meat

Source:
clinical – dark gray
meat source – light gray

Multidrug resistant isolates among predominantly meat-source isolates

Case: Klebsiella from urinary infections and from meat

The same strain (ST) types are found in both meat source isolates and isolates from human urinary tract infections.

Source: clinical – dark gray
meat source – light gray

What strategies are available to combat antimicrobial resistance?

• Farmer education
  – Decrease use of OTC antimicrobials / medicated feed

• Consumer-driven change – *e.g.* organic

• Voluntary withdrawal or restriction
  – Ceftiofur in Canada
  – Roxarsone in the U.S. (arsenic)
  – Guidance #213: voluntary phase-out of production uses by 2017

• Legal action
  – NRDC lawsuit

• Federal, state, or local regulation
  – Withdrawal of fluoroquinolone use in poultry
  – California SB27
**Medically important** antimicrobial drugs approved for use in food-producing animals

Actively marketed 2009-2017

Domestic sales and distribution data

Reported by dispensing status (combined annual totals)
HEALTH SECURITY
What is health security?

“[A]ctivities required, both proactive and reactive, to minimize vulnerability to acute public health events that endanger the collective health of populations living across geographical regions and international boundaries.” - World Health Organization

• Bioterrorism & conflict settings
• Outbreaks (pandemics)
• Natural disasters

Bioterrorism

• Deliberate release of disease-causing biological agent
• Viruses, bacteria, fungi, parasites and/or their products
• May cause disease in humans, animals or plants
• Agents may or may not be modified (i.e. “natural” pathogens released intentionally)
• Example: Anthrax (Category A)

Image source: How Stuff Works (www.science.howstuffworks.com)
Outbreaks

U.S.-Based Outbreaks

Recent investigations reported on CDC.gov
- Fresh Express Salad Mix Sold at McDonald’s – Cyclospora infections ANNOUNCED AUGUST 2018
- Hi-Yee Spring Pretzels #300 – Salmonella infections ANNOUNCED JULY 2018
- Raw Turkey Products – Salmonella infections ANNOUNCED MAY 2018
- Fresh Crab Meat – Vibrio infections ANNOUNCED JULY 2018
- Kellogg’s Honey Smacks Cereal – Salmonella infections ANNOUNCED JUNE 2018
- Pre-Cut Melon – Salmonella infections ANNOUNCED JUNE 2018
- Live Poultry in Backyard Flocks – Salmonella infections ANNOUNCED JUNE 2018
- Outbreaks of hepatitis A in multiple states among people who are homeless and people who use drugs ANNOUNCED MARCH 2017

International Outbreaks

- 2018 Ebola Outbreak in Congo (DRC) ANNOUNCED MAY 2018
- 2017 Ebola Outbreak in Congo (DRC) ANNOUNCED MAY 2017

Travel Notices Affecting International Travelers

Please see the Travelers’ Health site for a complete list.
- Alert: Malaria in Brazil ANNOUNCED JANUARY 2018
- Watch: Yellow Fever in Nigeria ANNOUNCED JANUARY 2018
- Alert: Yellow Fever in Rwanda ANNOUNCED JANUARY 2018
- Watch: Measles in Serbia ANNOUNCED JANUARY 2018
- Watch: Measles in Greece ANNOUNCED OCTOBER 2017
- Watch: Plague in Madagascar ANNOUNCED OCTOBER 2017
- Watch: 2018 Winter Olympics (PyeongChang 2018) ANNOUNCED NOVEMBER 2017

Understanding Outbreaks

In the last two years, CDC has sent scientists and doctors out more than 750 times to respond to health threats. Learn more below.
- Investigating Outbreaks
- CDC’s Role in Global Health Security

Further Sources for Content about Specific Outbreaks

- Multistate Foodborne Outbreaks – Foodborne outbreaks listed by year
- Health Alert Network – Health alerts, health advisories, updates, and info service messages. Designed for public health and medical communities.
- Recent Outbreaks and Investigations - Events involving the CDC Emergency Operations Center
- Mortality and Morbidity Weekly Report - Outbreak investigation reports included among other content. Note that outbreak material includes state health department investigations. Designed for public health and medical communities.
- Hepatitis A Outbreaks - This list represents hepatitis A outbreak investigations since 2013 where CDC supported or led the investigation.
Disaster

- A natural event (e.g., tsunami, earthquake, hurricane)
- A man-made error (e.g., explosion, hazmat spill)
- A man-made intentional act (e.g., terrorism, bioterrorism)
- Large-scale epidemics / pandemics
Disaster v. Emergency

**Emergency**: A natural or man-made situation that results in severe injury, harm, or loss

**Disaster**: Emergencies of a severity and magnitude that result in deaths, injuries, or property damage where the effects cannot be managed by the application of routine processes and resources
Preparedness

Mental & physical preparation

Skill & resources

Mentally disposed to respond

READY

WILLING

ABLE

PROBABILITY OF A QUALITY RESPONSE

McCabe OL, Barnett DJ, Taylor HG, Links JM. Disaster Med Public Health Prep. 2010
All Hazards Preparedness

• Preparation for an unlikely but devastating act of terrorism or bioterrorism similar to preparation for more likely but less devastating accident or natural infection
  – Example: Same or similar core public health and commercial infrastructure used to create and deliver vaccine against smallpox as for seasonal flu or for a pandemic infection

• Preparedness planning and training should be for “all hazards,” not just the most devastating scenario
# Trends in Health Security (NHSPPI)

<table>
<thead>
<tr>
<th>Topic</th>
<th>2018 National Average</th>
<th>Improvement Since 2013</th>
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<tbody>
<tr>
<td><strong>Overall score</strong></td>
<td>7.1</td>
<td>10.9%</td>
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<tr>
<td><strong>Health security surveillance</strong>: The ability to monitor and detect health threats, and to identify where hazards start and spread so that they can be contained rapidly.</td>
<td>8.1</td>
<td>12.5%</td>
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<tr>
<td><strong>Community planning and engagement</strong>: The ability to develop and maintain supportive relationships among government agencies, community organizations, and individual households.</td>
<td>6.0</td>
<td>22.4%</td>
</tr>
<tr>
<td><strong>Information and incident management</strong>: The ability to deploy people, supplies, money and information to the locations where they are most effective in protecting health.</td>
<td>8.8</td>
<td>7.3%</td>
</tr>
<tr>
<td><strong>Healthcare delivery</strong>: The ability to ensure access to high-quality medical services across the continuum of care during and after disasters and emergencies.</td>
<td>5.2</td>
<td>2.0%</td>
</tr>
<tr>
<td><strong>Countermeasure management</strong>: The ability to store and deploy medical and pharmaceutical products that prevent and treat hazardous substance effects and infectious diseases.</td>
<td>7.7</td>
<td>6.9%</td>
</tr>
<tr>
<td><strong>Environmental and occupational health</strong>: The ability to maintain the security and safety of water and food supplies, to test for hazards and contaminants in the environment, and to protect workers and emergency responders.</td>
<td>6.6</td>
<td>8.2%</td>
</tr>
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Source: 2018 National Health Security Preparedness Index

nhspi.org
Perception of risk

Controllable
Limited harm
Not global in threat
Non-fatal
Individual harm
Low risk to future generations
Easily reduced
Voluntary

Not observable
Unknown to those exposed
Delayed effect
New or unknown risk

More Acceptable

Observable
Known exposure
Immediate effect
Well-characterized, known risk

Less Acceptable

Uncontrollable
Great harm
Global in threat
Fatal
Catastrophic harm
High risk to future generations
Not easily reduced
Involuntary

Slovic 1987
Psychological casualty

Psychosocial-based impairment (inability to function)

Am I safe? Is my family safe?

Was I contaminated? How badly?

What will happen next?
Global One Health Security

- United Nations (UN)
  - Food and Agriculture Organization of the UN (FAO)
  - United Nations Development Programme
  - World Food Programme

- World Health Organization (WHO)
  - International Health Regulations

- World Organisation for Animal Health (OIE)

- International financial institutions (e.g. World Bank)

Biosecurity and Biocontainment

Hierarchy of Controls

- **Elimination**: Physically remove the hazard
- **Substitution**: Replace the hazard
- **Engineering Controls**: Isolate people from the hazard
- **Administrative Controls**: Change the way people work
- **PPE**: Protect the worker with Personal Protective Equipment

https://www.cdc.gov/niosh/topics/hierarchy/
Ebola response 2015

Photos courtesy of Dr. Amy Peterson
A mix breed dog named Excalibur that was euthanized today has set off a controversy about whether pets can carry and transmit the deadly Ebola virus to their owners or other humans.
Johns Hopkins Biocontainment Unit

https://www.hopkinsmedicine.org/biocontainment-unit/index.html
PREDICT Project

• Global study to predict the next pandemic threat
• Focus on people, domestic animals, and wildlife
• Emphasis on local/regional capacity-building internationally
• Collaboration among UC Davis SVM, EcoHealth Alliance, USAID, Smithsonian, others
• Ongoing through PREDICT-2

Key Points – One Health

• One Health is the interface of human, animal, and environmental health
• One Health methods can be applied to scientific research, government programs, and policy initiatives
• Stakeholders are people or organizations invested in the research or program
• Stakeholder engagement is important for One Health approaches
Key Points – Health Security

• “Disasters” include natural events (such as hurricanes), man-made accidents (such as chemical spills), and intentional acts of terrorism.
• “Disaster” differs from “emergency” in that emergencies are not foreseen and disasters exceed the local response capacity.
• “Preparedness” is a combination of prevention, preparedness, response, and recovery.
• The “all-hazards model” says that preparedness and response activities for natural disasters, accidents, and terrorism are essentially the same.
• Public health issues in disasters include deaths, injuries, acute and chronic diseases, property and infrastructure damage, and environmental impacts.
“I noticed what looked like a small white knob on one of the uptilted snouts. And there was another on that one—and that one...I reached down and seized a pig, and as I squeezed the swelling on the snout a cold wind blew through me...it wasn’t a knob, it was a vesicle, a delicate blister which ruptured easily on pressure.

‘Mr. Duggleby,’ I said. ‘I’m afraid I’ll have to telephone the Ministry of Agriculture...to tell them I have a case of suspected Foot and Mouth Disease.”
More late summer reading options...
185.600.81 One Health Tools to Promote and Evaluate Healthy and Sustainable Communities

**Department:** Environmental Health and Engineering  
**Term:** 4th term  
**Credits:** 3 credits  
**Academic Year:** 2017 - 2018  
**Location:** Internet  

**Auditors Allowed:** Yes, with instructor consent  
**Grading Restriction:** Letter Grade or Pass/Fail  
**Contact:** Meghan Davis  
**Course Instructor:**  
  - Meghan Davis  

**Resources:**  
  - CoursePlus

**Prerequisite:** 340.722.81 EPIDEMIOLOGIC INFRINGEMENT IN PUBLIC HEALTH or any equivalent or more advanced course in epidemiology Introduction to Online Learning

**Description:** Students will learn and apply tools and principles of One Health, which is the interface of human health, animal health and environmental health, to promote and evaluate healthy and sustainable communities. Classes will cover methods central to the conduct of One Health research or programs, which includes study design, stakeholder participation, community engagement and program evaluation, and will cover topics of high relevance to One Health in a way that uses systems approaches and synthesis to join perspectives from the multiple disciplines. These topics include drivers—such as the food system and antimicrobial resistance—that can contribute to or detract from the health and sustainability of communities. Methods will be presented in the context of applications such as policy, regulation, and economics and will connect One Health techniques for knowledge integration and other approaches to the design of healthy communities.
Practicum Opportunity

Vector-borne diseases (VBD) in the Americas
One Health Capstone Opportunities

- Animal Assistance Therapy
- Animal shelters and housing loss
- Unintended consequences (financial, animal welfare) from public health laws
- Sustainability in military farmer’s markets
- Pet ownership and health
- Many more...

- Data analysis (epidemiology)
- Qualitative data analysis
- Literature review
One Health Day 2016 (JHSPH One Health group)