One Health

Ronald Atlas
University of Louisville
Former Chair One Health Commission
One Health

• One Health is a concept that addresses contemporary health issues created by the convergence of human, animal, and environmental domains.

• The health of each domain is inextricably interconnected, yet practices in human and veterinary medicine and environmental issues often do not recognize these links.
One Health

• There is growing realization of the importance of the One Health concept and that there is a critical relationship between human medicine, veterinary medicine, and environmental sciences.

• The One Health initiative has important implications for public health, interdisciplinary research, academic programs, and public outreach.
One Health

• One Health is the collaborative effort of multiple disciplines – working locally, nationally and globally – to attain optimal health of humans, animals and our environment.

LONNIE J KING
Former DIRECTOR, NATIONAL CENTER FOR ZOONOTIC, VECTOR--BORNE, & ENTERIC DISEASES CENTERS FOR DISEASE CONTROL & PREVENTION
One Health

• Although environmental health is a major component of the One Health concept the emphasis is often placed on the veterinary component.
  – The One Health movement began with the American Veterinary Medical Association
    • Environment in a veterinary context is often equated with wildlife
    • For microbiologists zoonotic diseases have been a major one health focus
  – Much more attention needs to be paid to the Health of the Environment
Much Confusion about the Definition of “One Health”

- “One Health” means very different things to different people.
- Many avoid defining the boundaries of “One Health”.

From the Summary of the First One Health International Symposium
Should One Health include non-communicable diseases?

For example:

- Poverty
- Nutrition
- Obesity
- Oil spills
Bite the Bullet

“The prevention of human disease through the control of infection and disease in animal populations within all ecosystems.”

Jørgen Schlundt
Deputy Director of the National Food Safety Institute, at the Danish Technical University in Copenhagen.
TO AVOID BIRD SICKNESS
DON'T SLEEP IN THE SAME ROOM
WITH CHICKENS

PREPARED BY: BIRD FLU NATIONAL TASK FORCE.
FUNDING BY: MINISTRY OF HEALTH & SOCIAL WELFARE.
Emerging Infectious Diseases

- Translocation
- Encroachment
- Introduction
- "Spill over" & "Spill back"
- Agricultural Intensification
- Technology and Industry
- Human encroachment
- Ecological manipulation
- Human
- Global travel
- Urbanization
- Biomedical manipulation

Dasazak P. et.al. Science 2000 287:443
Emerging Disease Hotspots

zoonotic pathogens from wildlife

zoonotic pathogens from non-wildlife

Conclusions

Zoonotic infections are emerging as a result of a number of factors.
Keep the focus on infectious disease but we should include the interconnectivity of human, animal and plant diseases, and the environmental drivers.

Microbes are the connectors
One Health includes shared microbes

- Animals and humans
- Wildlife and domestic animals
- Ecosystems (including all reservoirs)
- WATER
Problem

Agriculture, Human Health, Wildlife, and Ecological sectors do not always work well together.
The Bottom Line

Despite differences over the definition or what the focus of “One Health” should be, microbes are first and foremost as they are the connectors across humans, animals and the environment.
Human

Population growth
Urbanization, crowding
Globalization of travel and trade

http://www.flickr.com/photos/pulpolux/4822047275/
Animal markets
Intensified livestock production
Misuse of antibiotics
Deforestation
Biodiversity loss
Global climate change
Ecological

http://www.flickr.com/photos/wak1/4171425140/
Need Focus on the Ecological Dimension of Disease Emergence

...it’s especially critical in the developing world

http://www.flickr.com/photos/sharman/355815048/
The whole history of science has been the gradual realization that events do not happen in an arbitrary manner, but that they reflect a certain underlying order…  Stephen Hawking
Environmental Change
Lyme, Connecticut

1910

Today
Zoonotic Transmission of

*E. coli* O157:H7
WARNING!
LEPTOSPIROSIS
HEALTH HAZARD
FRESH WATER STREAMS AND MUD POSSIBLY POLLUTED WITH BACTERIA
EXERCISE CAUTION
Trophic Cascade Hypothesis – Lag in Population Responses Should Allow Lead Time to Forecast

- Increased Moisture
- Vegetative Growth
- Terrestrial Arthropod Pop’ n Increases
- Increase HPS
- Rodent Pop’ n Increases
Trophic Cascade Graph, Rodent

Human Cases

Infected Rodents

Source: Terry Yates, University of New Mexico
Evolution of daily cholera dynamic in Senegal from 05/11/2005 to 12/31/2005

Total Cases

Total Deaths

Courtesy G. Constantin de Magny and B. Roche

Source: Senegalese Ministry of Health
WHO
Water, health and ecosystem linkages

• Most of the earth's surface is covered by water, and most of the human body is composed of water – two facts illustrating the critical linkages between water, health and ecosystems.
WHO
Deaths from Unsafe Water

WSH deaths/million

0 - 10
10 - 50
50 - 100
100 - 200
200 - 500
500 - 1050
No Data

The boundaries shown on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted lines on maps represent approximate border lines for which there may not yet be full agreement.
WHO

More than one-third of the world's population lives within 100 kilometers of a sea shore. Coastal ecosystems include features such as wetlands, estuaries, mangroves and coral reefs – all of which provide 'services' vital to human health and well-being.
• natural filtration of freshwater sources in wetlands and forests;
• provision of habitats for fish and other food sources to spawn and develop;
• provision of livelihoods and recreational sites; and provision of coastal barriers against sea level fluctuation.
WHO
COASTAL ECOSYSTEMS: A SPECIAL FOCUS OF CONCERN

• Unsustainable development of aquaculture and tourism, transport and industrial facilities, and even dams upstream, can irreversibly diminish vital coastal ecosystem services to human health.

• Preserving the health of coastal ecosystems is vital to the health and well-being of an increasing proportion of the world's population.
WHO

Integrated water resource management

• Different users within a watershed are interdependent
• Integrated water resource management is essential.
• Upstream uses of water impact the potential of downstream users to meet their needs.
• Land use, agricultural patterns, and industrial development all affect water resources.
CDC Research Initiatives

• The National Center for Zoonotic, Vector-Borne, and Enteric Diseases (ZVED) was newly organized in April 2007 to:
  – Accelerate efforts aimed at prevention, control, and preparedness of ecologically mediated microbial threats.
  – Provide global vision, global presence, global reach, and health impact.
  – Work at the intersection of human, animal, and ecological health to achieve healthier people, places, and a healthier world.
Center for Zoonotic, Vector-Borne, and Enteric Diseases

• Foodborne, Bacterial and Mycotic
  – Bacterial zoonoses
  – Foodborne disease surveillance (FoodNet) and molecular subtyping of foodborne pathogens (PulseNet)

• Parasitic Diseases
  – Control of neglected tropical diseases
  – Malaria and Chagas disease surveillance, prevention, and control

• Vector-Borne Infectious Diseases
  – Mosquito, flea and tick-borne diseases

• Viral and Rickettsial Diseases
  – Viral hemorrhagic fevers
  – Rickettsial diseases
  – Prion diseases
An Action Agenda for One Health

• Strengthen disease surveillance, prevention, and control in animal populations from which emerging zoonotic diseases emerge;
• Integrate human and animal disease surveillance and early detection in both animal and human populations;
• Improve communication among environmental, animal, and human health professionals and agencies;
• Increase the numbers of veterinarian and microbiologist experts in public health, food safety, wildlife health, pathology, laboratory science, and environmental health to work with human health experts on integrated health teams;
An Action Agenda for One Health

• Support integrated environmental, animal, and human health research on the factors promoting emergence of disease, on interventions to prevent their occurrence, and on interventions that protect human and animal health and the health of the environment.

• Gradually shift from infectious diseases to environmental health
  – Move from emphasis on pathogens to include pollutants
  – Increase recognition of impacts of global warming
  – Global climate change—droughts and storms