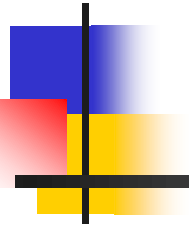


One Health: A Concept for the 21st Century



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- What is One Health?
- The concept: human health is inextricably linked with animal and environmental health.
- One Health seeks to increase communication and collaboration between human, animal, environmental health professionals.
- www.onehealthinitiative.com



Why One Health?

- Zoonotic disease risks from wildlife, livestock, and pets.
- Over 75% of emerging infectious diseases are zoonotic
- 60% of human pathogens are zoonotic.
- Most agents of bioterrorism are zoonotic.
- Beyond zoonoses: Disease processes across species are shared.

The Price of Agriculture and Domestication of Animals

- Agriculture about 10,000 years ago.
- Agriculture allowed civilization to develop. Towns and cities grew.



<http://www.nature.com/nature/journal/v447/n7142/full/nature05775.html>



Price of Agriculture

- Measles (Rinderpest) Cattle
- Pertussis Pigs
- Smallpox ?
- Brucellosis, Q fever Goats/Sheep
- Tularemia Rabbit/Squirrels

Hippocrates (ca. 460 BCE--ca. 370 BCE)

Recognized link
between human
health and the
environment.

Malaria=Mal (bad)
+ aria (air) in
swampy areas



Relief from the sanctuary of Oropos, dedicated to the physician Amphiarhos, showing Hippocrates treating a patient

Middle Ages (14th Century): Black Death

Yersinia pestis

Spread by fleas
carried by rats





Beginning in the 18th century...

Some of the greatest discoveries in the history of medicine and public health were made at the intersection between human and animal health.

18th Century: Vaccination against smallpox



“Vacca” is
Latin word
for cow.



Dr. Edward Jenner vaccinating 8 yr old boy

Opposition to Vaccination



19th Century: Germ Theory of Disease



- Louis Pasteur, French chemist studied chicken cholera
- Robert Koch, German physician studied anthrax

Additional 19th Century Developments



- Rudolf Virchow (1821-1902), a German physician and pathologist said, "between animal and human medicine there are no dividing lines--nor should there be."
- Coined term "zoonosis"

Early Meat Inspection Programs Improved Food Safety

- Virchow's father was a butcher.
- Animal experiments on life cycle of *Trichinella spiralis* in porcine muscular tissue.
- Studied cysticercosis and tuberculosis in cattle.



19th Century Developments



- Sir William Osler received his medical degree from McGill University, Canada
- Went to Berlin to work with Virchow
- Returned to Canada in 1874
- Est. veterinary pathology as an academic discipline in North America

19th Century Discovery: Diseases can be transmitted by arthropods



- Theobald Smith, MD (pictured) and F.L. Kilbourne, DVM discovered cause of cattle fever
- *Babesia bigemina* transmitted by the cattle tick.
- Set the stage for Walter Reed and colleagues' discovery that mosquitoes transmit yellow fever.

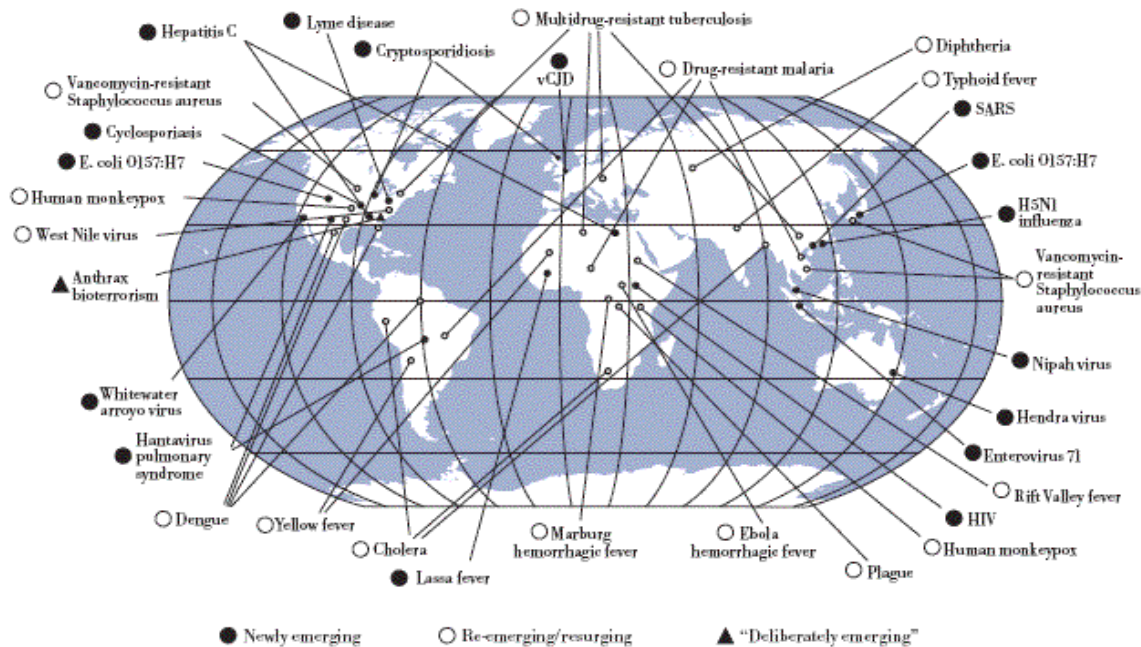


20th Century Developments

- Scientific knowledge exploded
- Medicine became increasingly specialized
- Medicine and veterinary medicine diverged

Emergence of new Infectious Diseases in 20th century

FIGURE 1 EXAMPLES OF EMERGING AND RE-EMERGING INFECTIOUS DISEASES THROUGHOUT THE WORLD.



Adapted from Morens, D.M., et al. 2004. The Challenge of Emerging and Re-emerging Infectious Diseases. *Nature* 430:242-49.

Why are these diseases emerging?



- Increasing global population pressures
- Deforestation and environmental destruction
- Intensive agriculture
- Global trade and travel
- Possibly climate change

Risks of Pet Ownership:

Microbes are shared

New York Times, September 21, 2009



Dr. Elizabeth A. Scott et al. swabbed household surfaces at 35 randomly selected addresses. Nearly half of homes had MRSA on surfaces.

Cat owners were 8 times more likely than others to have MRSA at home.

**“Tie to pets has germ jumping to and fro”
Methicillin Resistant Staph aureus (MRSA)
is infecting both humans and animals.**

One Health is more than just infectious diseases: Many disease processes are shared



Echocardiograms on Tamarin monkeys

"Capture myopathy" = "Takotsubu cardiomyopathy"

Nature 1974

Japanese journal 2000



Dr. Barbara Natterson Horowitz,
UCLA Cardiologist, "Zoobiquity"²⁰

photo by Laura Kleinhenz



Challenges of the 21st century

- Medicine and Public Health require a new paradigm, One Health:
 - Zoonotic diseases
 - Cancer
 - Cardiovascular Diseases
 - Metabolic Diseases
 - Neurological Diseases
 - Degenerative Diseases and Injuries
 - And others...



One Health resources

- One Health information websites
- Academic inter-disciplinary journals
- One Health outreach efforts



One Health websites

<http://www.onehealthinitiative.com/>

<https://www.onehealthcommission.org/>

<http://www.cdc.gov/onehealth/>

http://www.aphis.usda.gov/animal_health/one_health/supporters.shtml

<https://www.avma.org/KB/Resources/Reference/Pages/One-Health.aspx>

<http://www.worldvet.org/taxonomy/term/19>

<http://www.wcs.org/conservation-challenges/wildlife-health/wildlife-humans-and-livestock/one-world-one-health.aspx>

<http://www.ecohealthalliance.org/>

http://ec.europa.eu/dgs/health_consumer/dyna/consumervoice/create_cv.cfm?cv_id=490

<http://www.onehealthglobal.net/>

http://en.wikipedia.org/wiki/One_Health#cite_note-41



Academic Inter-disciplinary Journals

<http://www.nature.com/> and
<http://www.sciencemag.org/>

<http://wwwnc.cdc.gov/eid/>

<http://www.ecohealth.net/aboutus.php>

<http://www.infectionecologyandepidemiology.net/index.php/iee>



Other One Health Outreach Efforts

http://www.doh.state.fl.us/environment/medicine/One_Health/OneHealth.html

<http://www.onehealthtalk.org/>

<http://www.onehealthacademy.org/>

One Health Congress (Melbourne, Australia 2011 and Bangkok, Thailand 2013)



How can physicians engage in One Health?

- Develop collegial relationships with veterinarians.
- Educate colleagues and students about One Health.
- Promote interdisciplinary (One Health) information and resources.
- Develop inter-disciplinary One Health clinical and research efforts
- Continue One Health sessions like this one.



Take Home Messages

- Human, animal, and environmental health are linked.
- One Health concept provides an important strategy to improve the lives of all species
- One Health is a growing movement, but needs cultivation and support.
- There are many online resources, but not much funding.
- Physicians should develop collegial relationships with veterinarians.
- Public health can play a key role in advancing One Health.



One Health Endorsements

- American Medical Association
- American Veterinary Medical Association
- American Nurses Association
- American Association of Medical Colleges
- American Association of Veterinary Medical Colleges
- American Society for Microbiology
- American Society of Tropical Medicine and Hygiene
- Council of State and Territorial Epidemiologists
- Association of Schools of Public Health



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<http://www.onehealthinitiative.com>

Thank you!

