One Health: Relevance to Laboratory Biosafety and Biosecurity

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BIOSECURITY ENGAGEMENT PROGRAM

International BIOLOGICAL THREAT REDUCTION

Definition:
One Health

One Health seeks to promote, improve, and defend the health and well-being of all species by enhancing cooperation and collaboration between physicians, veterinarians, and other scientific health professionals and by promoting strengths in leadership and management to achieve these goals.

One Health Initiative: http://www.onehealthinitiative.com/index.php

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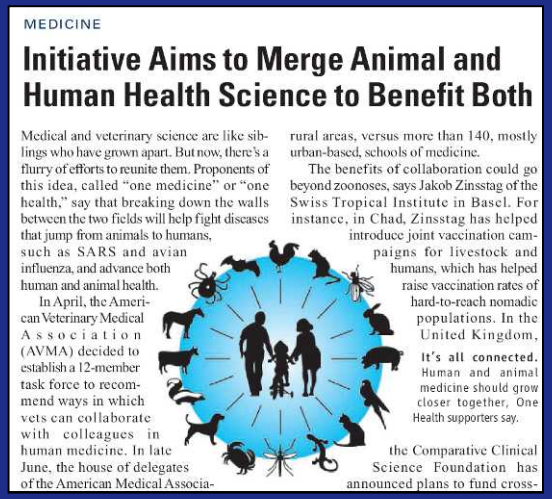
History:
One Health

- **The concept of combining animal and human health endeavors has existed since the 19th century**
  - Osler and Virchow – Developed the field of comparative pathology
  - Koch and Pasteur – Extensive work with zoonotic pathogens
  - Jenner – Utilized cow pox virus to protect against the small pox virus

- **Pioneers in the field of One Health become known in the mid 20th century**
  - Dr. James Steel organized the first Veterinary Public Health program with the US Centers for Disease Control (CDC) in the 1940s and introduced veterinarians into the US Public Health Service in 1947
  - Dr. Calvin Schawbe came up with the term “One Health” and spent his career advocating the utility of integrating animal and public health systems and developing tools to support this effort

Benefits:
One Health

- **The Benefits of the One Health approach as proposed by the American Veterinary Medical Association (AVMA) in 2008**
  - Improving animal and human health globally through collaboration among the health sciences
  - Meeting new global challenges head-on through collaboration among multiple professions
  - Developing centers of excellence for education and training by developing collaborations between medical and veterinary colleges
  - Improved scientific knowledge to create innovative programs to improve health



MEDICINE

Initiative Aims to Merge Animal and Human Health Science to Benefit Both

Medical and veterinary science are like siblings who have grown apart. But now, there's a flurry of efforts to reunite them. Proponents of this idea, called "one medicine" or "one health," say that breaking down the walls between the two fields will help fight diseases that jump from animals to humans, such as SARS and avian influenza, and advance both human and animal health.

In April, the American Veterinary Medical Association (AVMA) decided to establish a 12-member task force to recommend ways in which vets can collaborate with colleagues in human medicine. In late June, the house of delegates of the American Medical Associa-

rural areas, versus more than 140, mostly urban-based, schools of medicine.

The benefits of collaboration could go beyond zoonoses, says Jakob Zinsstag of the Swiss Tropical Institute in Basel. For instance, in Chad, Zinsstag has helped introduce joint vaccination campaigns for livestock and humans, which has helped raise vaccination rates of hard-to-reach nomadic populations. In the United Kingdom,

It's all connected. Human and animal medicine should grow closer together, One Health supporters say.

the Comparative Clinical Science Foundation has announced plans to fund cross-

Impact of One Health on Infectious Diseases

- **Adapting One Health initiatives will integrate public and animal health sectors to help combat infectious diseases through:**
  - Improved detection of emerging and re-emerging infectious diseases in human and animal populations
  - Implementation of more effective control measures to combat zoonotic diseases globally
  - Enhanced public health through food safety
  - Broaden basic research in the area of zoonotic diseases

OIE

"One World One Health"

World Health Organization

"Veterinary Public Health"

Food and Agriculture Organization of the United Nations

for a world without hunger

"One World One Health"

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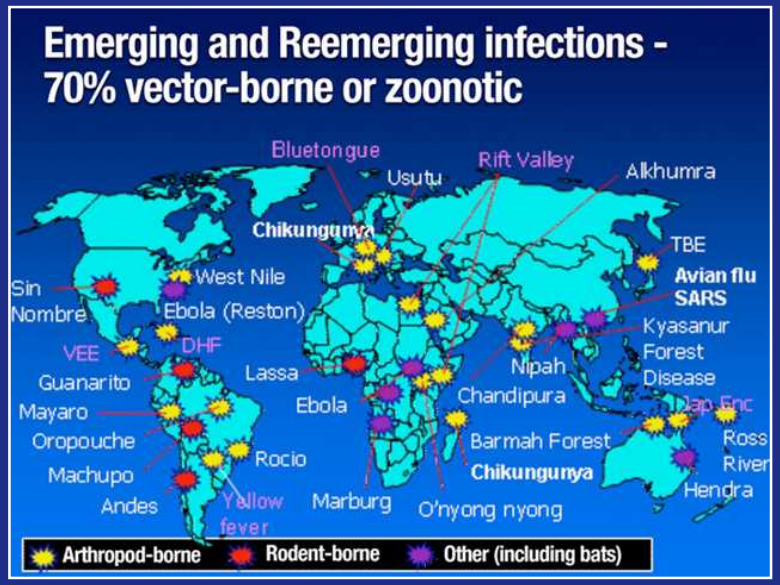
Emerging and Re-emerging Infectious Diseases

- **Recently the impact of infectious diseases of animal origin has become increasingly more apparent and more common**
  - 60% of human pathogens are zoonotic
  - 80% of animal pathogens are multi-host
  - 75% of emerging diseases are zoonotic
  - 80% of potential bioterrorism agents are zoonotic pathogens
- ***Nearly all new human (infectious) diseases that have emerged within the past 10 to 15 years have been found to have originated from animal reservoirs***



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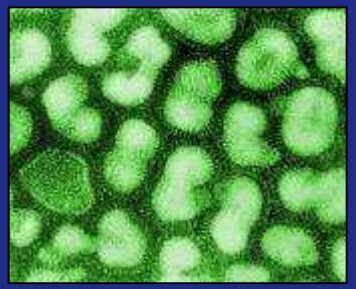
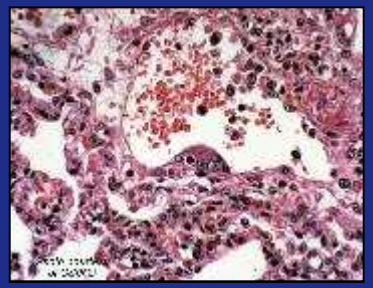
Detection of Emerging and Re-emerging Infectious Diseases

- **Developing partnerships between public and animal health sectors can facilitate the rapid detection of emerging and/or re-emerging infectious diseases**
  - Comprehensive surveillance programs
  - Open communication between public and animal health agencies to report outbreaks of zoonotic diseases
  - Collaborative efforts between public and animal health diagnostic laboratories to improve methods to detect and diagnose zoonotic pathogens

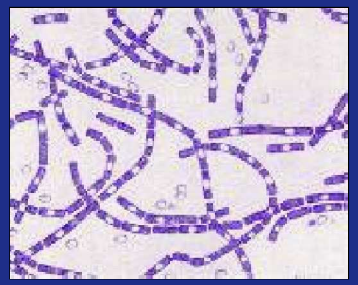


Avian influenza virus

SARS virus



Nipah virus in pig lung



Bacillus anthracis

Combined Control Measures to Combat Zoonotic Diseases

- **Animal interventions targeting zoonotic diseases have improved public health**
  - Zinsstag reported human benefits from animal interventions for control of brucellosis, rabies, and avian influenza
  - Joint delivery of public health and veterinary services for nomadic pastoralists in Chad
- **Prevention through awareness raising and outreach**
  - Collaboration across biomedical sectors can improve public awareness of animal diseases that infect humans
  - Veterinarians can alert physicians of regional or endemic zoonosis in the animal populations and physicians can alert veterinarians of human cases of zoonotic diseases
- **Comprehensive surveillance programs**
  - FAO has implemented the Global Early Warning System for major animal diseases and zoonosis
    - **GLEWS is a joint system that combines alert mechanisms of the World Health Organization (WHO), the Food and Agriculture Organization of the United Nations (FAO), and the World Organization for Animal Health (OIE) to assist in prevention and control of zoonotic disease threats through information sharing and risk analysis**
    - **http://www.glews.net/**

GLEWS

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Improved Food Safety

- **Establishing One Health practices can help minimize human exposures to infectious agents present in food**
  - Veterinarians can support the public health sector by improving animal health to help minimize food contamination by infectious pathogens
  - Veterinarians can help the public health sector provide outreach to educate the public on issues related to food contamination
  - Veterinarians can help educate public health professionals on food products that can be contaminated
  - Veterinarians and physicians can collaborate to resolve outbreaks of food borne illnesses

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One Health:
Laboratory Biosafety and Biosecurity

- **Laboratory biosafety and biosecurity practices are largely pathogen driven and can support the One Health Concept but specific practices from relevant biomedical sectors may improve procedures and protocols**

- **The audience consists of biomedical professionals from both the public and animal health sectors**

  - How do you see One Health impacting your work from a safety and security perspective?

    - **Diagnostic medicine**

    - **Basic research**

    - **Health care providers**

Diagnostic Medicine

- **Collaboration on optimizing diagnostic methods that will support laboratory safety and security**
  - Utilize tests that limit pathogen handling by laboratory staff when appropriate
    - **Polymerase chain reaction assays**
    - **Enzyme Linked Immunosorbent Assays (ELISA)**
    - **Serology**
- **Collaborate to develop Standard Operating Procedures (SOPs) describing safe and secure handling of zoonotic pathogens**
  - Public health professionals can provide insight related to human manifestations of zoonotic diseases that may appear in laboratory staff
  - Veterinary professionals may have more expertise related to safe sample collection methods and handling in the laboratory
- **Report all potential exposures because they could ignite outbreaks**
- **Implementation of occupational health standards for laboratory staff requires close and continuing communication between public and animal health professions**

Basic Research

- **Characterization of emerging or re-emerging infectious diseases will require that public and animal health professionals work closely**
  - Nearly all of the emerging and re-emerging infectious diseases of humans have been found to be animal in origin
  - In many instances the disease has not been described in humans or animals
- **Understanding disease pathogenesis must be done using comparative pathology and animal models**
- **Efficacious diagnostic methods for zoonotic pathogens will be more robust if targeted toward both animals and humans**

Health Care Providers

- **Develop SOPs for safe and secure diagnostic sample processing**
  - Collection
  - Handling
  - Transportation
  - Disposal
- **Transparent reporting of outbreaks of zoonotic and unknown infectious diseases in both humans and animals**
  - Will alert all biomedical professionals of a potential outbreak of a known zoonotic agents or potential emerging pathogen
  - Information should be secured
- **Comprehensive surveillance programs to help minimize the spread**
  - Fewer cases will minimize sample collection and processing

Conclusions

- One Health Initiatives can enhance early detection and control of zoonotic diseases but specific practices from relevant biomedical fields and improve procedures and practices
- Initiatives to control and prevent many zoonotic disease have been shown to improve public health
- Approaches to laboratory biosafety and biosecurity are largely pathogen driven and support the One Health concept