

# AN INTRODUCTION TO ONE HEALTH

*Comments by*

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*for the*

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*The findings and conclusions in this presentation are those of the author and do not necessarily represent the views of the George Washington University or the U.S. Food and Drug Administration.*



# Outline of today's presentation...

- What is “One Health”?
- History followed by a few examples:
  - Zika virus, Lyme disease
- Environmental Sentinels:
  - White-nose Syndrome, Colony Collapse Disorder, Coral reefs
- Climate Change.
- Preventing Diseases through Healthy Environments.
- Translational Biology.
  - Oncology, Craniofacial reconstruction
- Obesity.
- One Health Case Studies for academia.
- Antimicrobial Resistance.
- Human-Animal Interactions.
- One Health Opportunities.
- Legislation - One Health Act of 2016
- Annual One Health Day Nov. 3<sup>rd</sup>

# The Concept of One Health

The concept of One Health is not really new, considering the fact that 2,500 years ago it was **Hippocrates** who “**urged physicians to consider where their patients lived, the foods they ate and waters they drank, their lifestyles, and the seasons of the year.**”

In the 19th century, **Rudolf Virchow, MD**, (1821-1902), the “Father of Pathology” stated that “**between animal and human medicine there are no dividing lines–nor should there be.**”

It was **Calvin W. Schwabe, DVM, MPH, ScD** (1927-2006) who coined the term “**One Medicine**” in his textbook *Veterinary Medicine and Human Health* in 1965.

# One Health Defined

"One Health is the 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 2008*



# Why One Health?

- Worldwide, nearly 75 percent of all emerging human infectious diseases in the past three decades originated in animals.
- Climate change, increased CO<sub>2</sub> levels, land-use changes, resource scarcity, decreased biodiversity, loss of pollinators, dams and irrigation projects, air and water pollution, and encroachment into wildlife habitat are just a few of the items impacting the ecosystem which in turn affects the health of humans and animals.
- The world population is projected to grow from 7.4 billion in 2016 to 9 billion by 2050... further increasing humanity's ecological footprint.
- To provide adequate healthcare, safe food and safe water for the growing global population... a collaborative and trans-disciplinary approach is needed (e.g. agricultural scientists, anthropologists, economists, educators, engineers, entomologists, epidemiologists, hydrologists, microbiologists, nutritionists, physicians, policy makers, public health professionals, sociologists, and veterinarians ... working together! ).
- The human-animal bond beneficially impacts the health of both people and animals... a unique role in the scope of One Health.



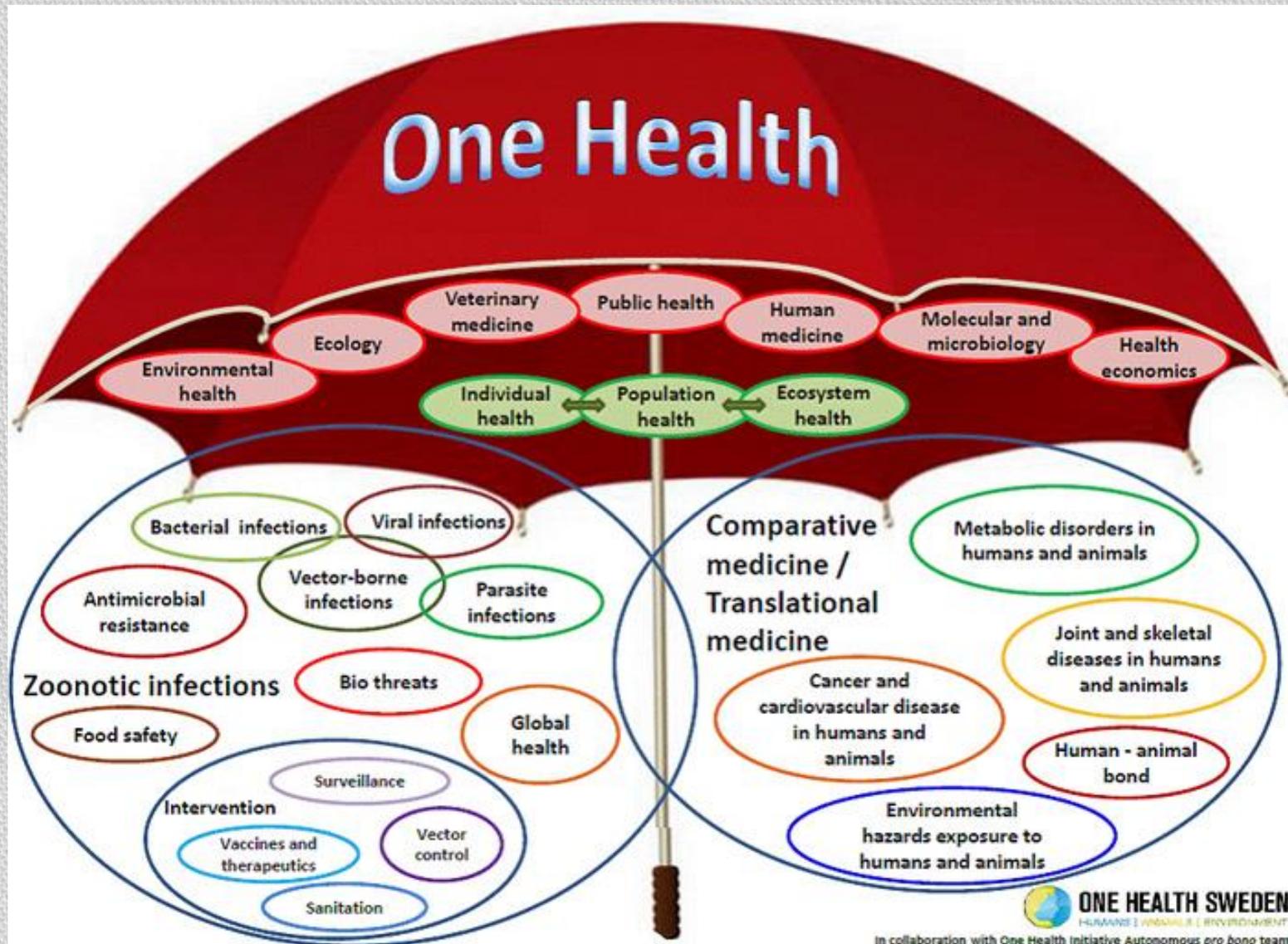
### Mission Statement:

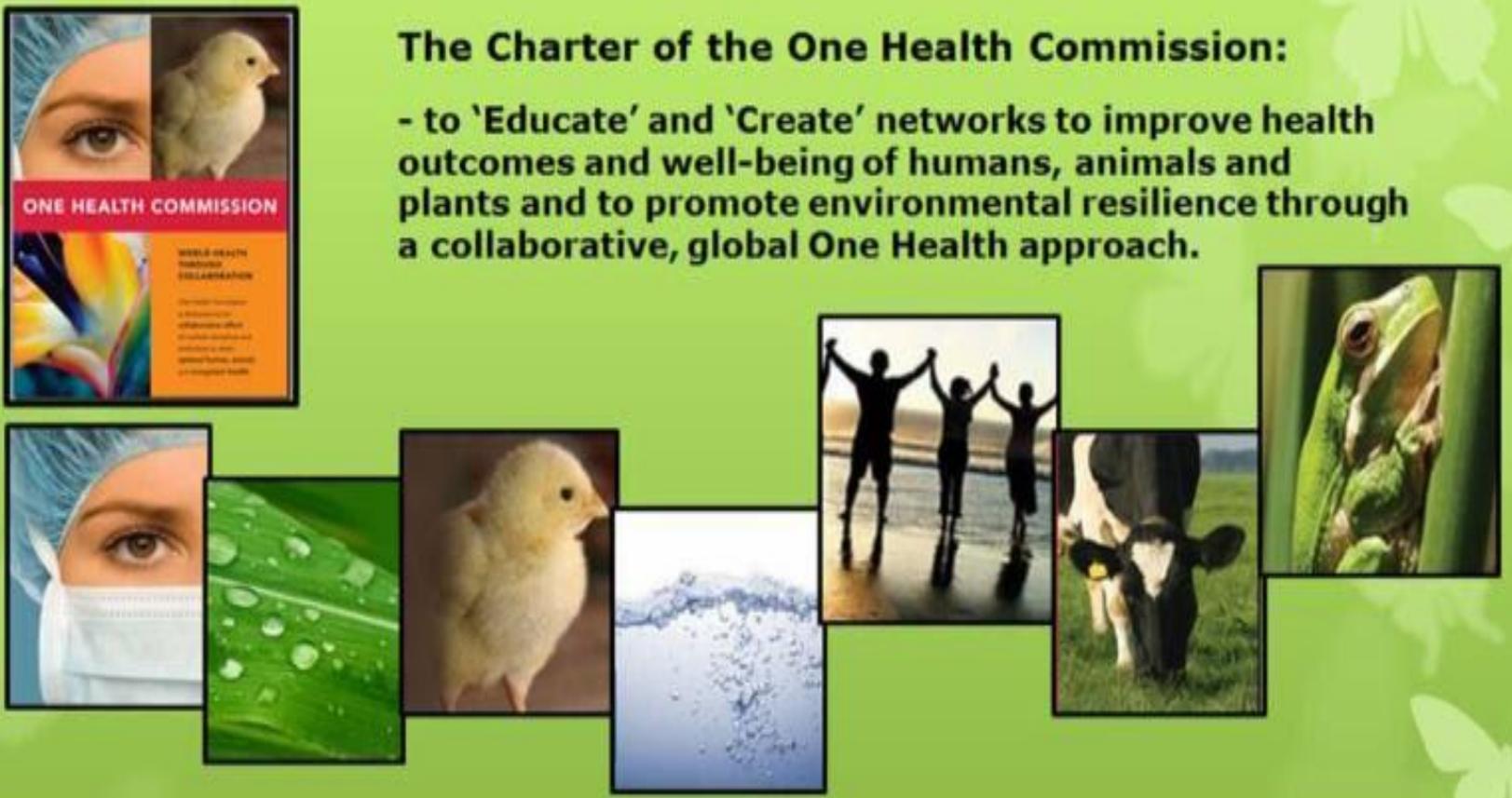
Recognizing that human health (including mental health via the human-animal bond phenomenon), animal health, and ecosystem health are inextricably linked, One Health seeks to promote, improve, and defend the health and well-being of all species by enhancing cooperation and collaboration between physicians, veterinarians, other scientific health and environmental professionals and by promoting strengths in leadership and management to achieve these goals.

**One Health Initiative Website: <http://www.onehealthinitiative.com/mission.php>**

(The One Health Initiative Autonomous *pro bono* team (OHI) was co-founded in 2006.)

# Scope of 'One Health' as per the One Health Initiative





**The Charter of the One Health Commission:**

- to 'Educate' and 'Create' networks to improve health outcomes and well-being of humans, animals and plants and to promote environmental resilience through a collaborative, global One Health approach.

**One Health Commission Website: <https://www.onehealthcommission.org/>**

(The One Health Commission is a globally focused organization dedicated to promoting improved health of people, domestic animals, wildlife, plants and the environment. It is a 501(c)(3) organization, chartered in Washington, D.C. on June 29, 2009.)



Mission: The One Health Platform is a strategic forum of stakeholders and a One Health reference network that aims to enhance understanding of and preparedness for the current and future outbreaks of zoonoses, emerging infectious diseases in humans and animals, and antimicrobial resistance, including the ecological and environmental factors which impact on these diseases.



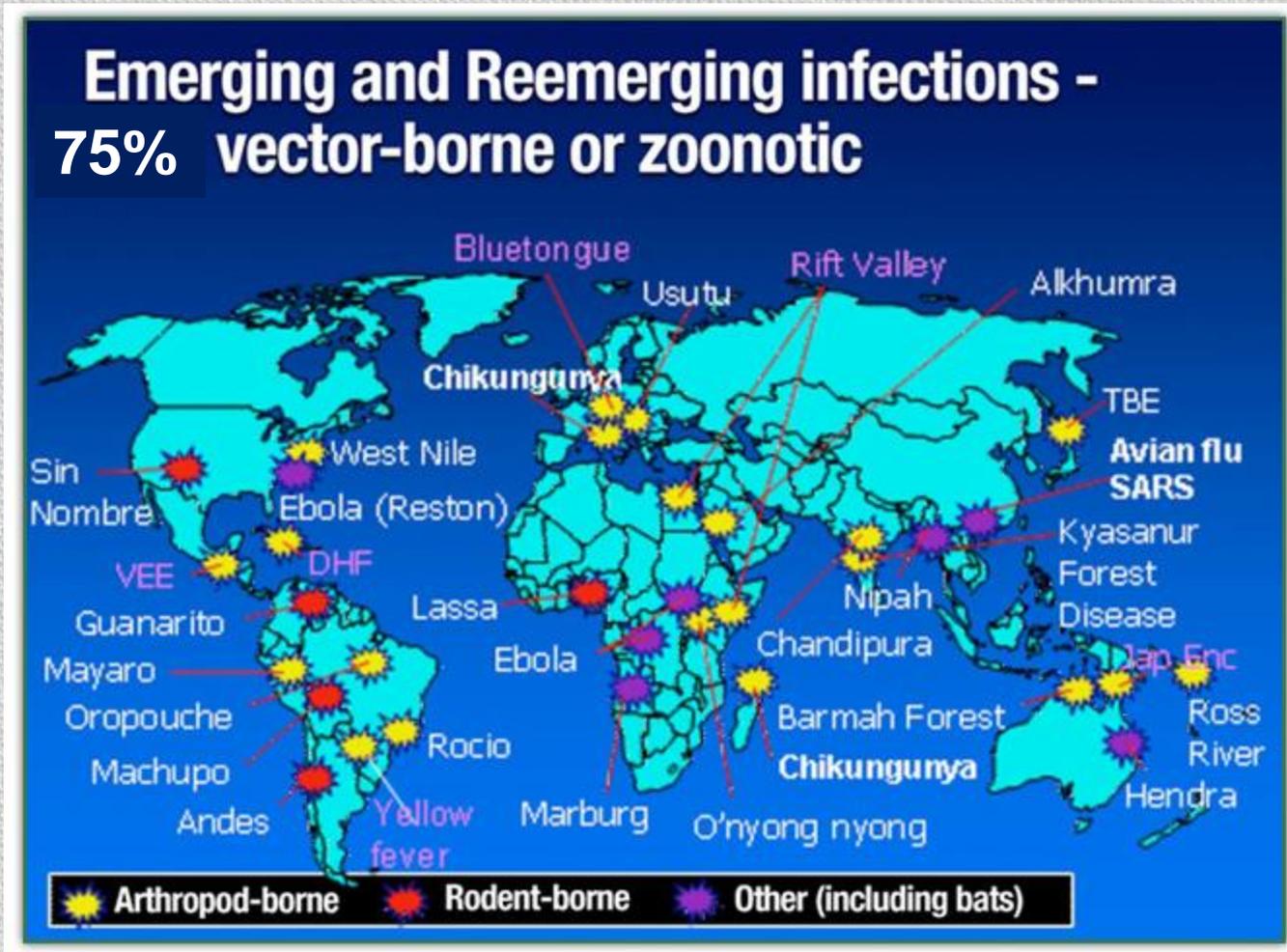
**Creating a healthy future for humans, animals and their environments.**



**The One Health Platform website: <http://onehealthplatform.com/>**

(The One Health Global Network Webportal was established in 2011)

# Emerging & Re-emerging infections - Zika Virus is the next arthropod-borne infection to be added to the map.



# Zika Virus – Exemplifies “One Health”

The One Health approach brings together entomologists, physicians, veterinarians, virologists, wild life biologists, environmental experts, universities, governments, public health organizations, world health organizations, just to mention a few... all seeking to help address the following needs:

- Zika virus infection is usually asymptomatic or causes mild illness (e.g. fever, rash, muscle/joint pain), however, CDC has recently concluded that Zika virus infection during pregnancy can cause microcephaly and other severe fetal brain defects. Association with autoimmune-like illnesses such as Guillain-Barre syndrome is under investigation.
- Commercial vaccines and specific antiviral drug treatment for Zika virus infection are needed. Funding for basic research and vaccine/drug development is required.
- The FDA has issued Emergency Use Authorization for several diagnostic tests for Zika virus (e.g. blood, urine or saliva samples).

# Zika Virus – Exemplifies “One Health” cont’d

- Mosquito (*Aedes* genus) vector control needs focused intervention (e.g. removal of water-containing sources; insecticide sprays; utilizing genetic engineering mosquitoes to suppress the mosquito population); risk communication/education to help the public avoid mosquito exposure.
- Enhanced surveillance systems are needed; collecting and analyzing data to assist with public health strategies.
- Determining whether there are non-human reservoirs for Zika virus needs to be established; studying the viral strains may help explain why the virus has demonstrated the capacity to spread exponentially in the human population in the Americas.
- Medical care of new born infants with microcephaly is needed which means assessing the medical infrastructure at local and national levels; financial commitment; government engagement; policy development at local, national, international levels.

# A few examples of Mosquito borne diseases



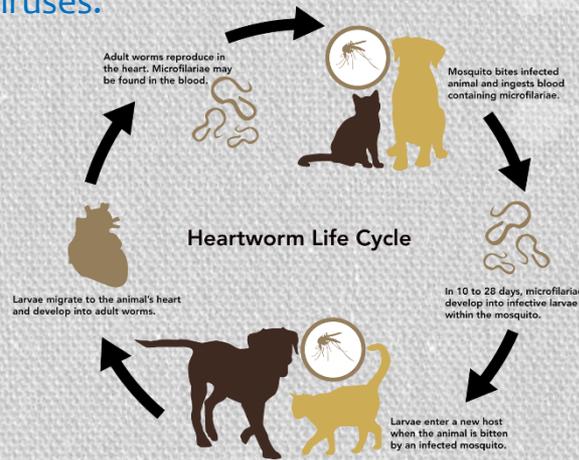
*Aedes aegypti* mosquito transmits Dengue, Chikungunya, **Yellow fever**, and Zika viruses.



Mosquito transmitted Zika virus can cause microcephaly.



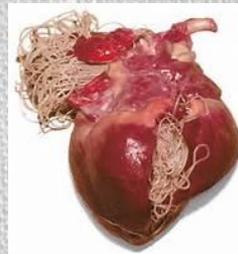
Asian Tiger (*Aedes albopictus*) transmits West Nile virus, Equine Encephalitis virus.



*Anopheles* sp. transmits malaria (*Plasmodium falciparum*).



*Culex tritaeniorhynchus* transmits Japanese encephalitis virus.



Mosquito transmits *Dirofilaria immitis* heartworm larvae.

# Emerging Diseases of Global Health and Agricultural Concerns – Links Between Animal and Human Health

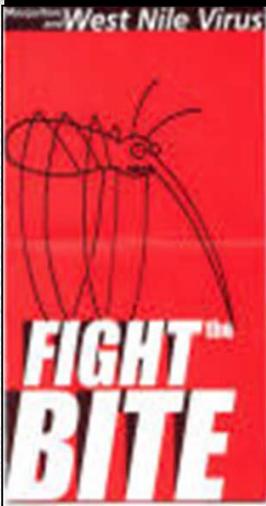
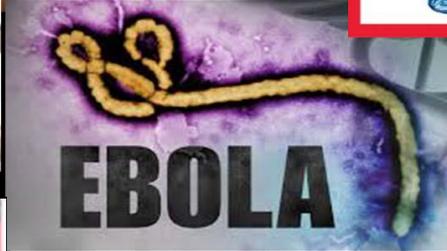
Middle East Respiratory Syndrome (2012)



Ebola Outbreak (2014)



Avian Influenza H5N2 (2015)



Severe Acute Respiratory Syndrome (2003)



Bovine Spongiform Encephalitis (1986)



Escherichia coli –O157:H7 (1998)



West Nile Virus (1999)

H1N1 Influenza (2009)

# Lyme Disease is on the rise...



Ixodes tick (deer tick) nymph



Rash may or may not develop.



Lyme Disease is caused by a spirochete—a corkscrew-shaped bacterium called *Borrelia burgdorferi* transmitted by Ixodes ticks.

**Shorter winters and increased temperatures enhance the survival of the ticks.**

Primarily people & dogs get Lyme Disease but other animals can become infected (horses, deer, cattle, cats (rarely) & mice). Known as the “great imitator” because it mimics other diseases.

People: flu-like illness (fever, chills, sweats, muscle aches, fatigue, nausea and joint pain); **early & chronic forms**.

Dogs & horses: shifting leg lameness, swollen joints, lethargy, fever and anorexia.

Prevention: a vaccine is available for dogs.

Treatment: typically antibiotics (e.g. doxycycline) are prescribed for people, dogs and horses.

# White-nose Syndrome in Bats – loss of pollinators



Research projects are focused on managing WNS - identifying a biological control agent for the fungus is key.

Active collaboration with scientists, managers, lawmakers and the public is needed to address WNS via a **One Health** approach!

White-nose Syndrome (WNS) is a disease caused by the **fungus *Pseudogymnoascus destructans***. The disease is estimated to have killed over six million bats in eastern North America since 2006, and can kill up to 100% of bats in a colony during hibernation. The disease is caused by a fungus from Eurasia, which was accidentally transported here by humans. There are no antifungal vaccines.

## Bats are important for:

- a. **Pest control** - the primary predators of night-flying insects including many damaging agricultural pests.
- b. **Pollination** – from deserts to rainforests, nectar-feeding bats are critical pollinators for a wide variety of plants of great economic and ecological value.
- c. **Seed dispersion** – fruit eating bats scatter seeds helping to restore forests.

We can expect to see significant ecosystem changes in the coming years following the loss of the bat population!

# Honey Bees - Loss of pollinators continues.



Honey bees in hive.

Nation's beekeepers lost 44% of bee colonies in 2015-16.  
(Survey by Bee Informed Partnership - Univ. Maryland 5-10-16; USDA Report 5-12-16)

A variety of factors may be the cause: pesticides, Nosema (a disease causing fungus), the Varroa mite, and changing land use patterns.



Varroa mites on a bee.

**Varroa destructor** is an external parasitic mite that attacks the honey bee *Apis cerana* and *Apis mellifera*. It feeds on the hemolymph, weakens the bee and enables infection by harmful pathogens such as viruses, bacteria or fungus to develop.

**Colony Collapse Disorder** – loss of worker bees with few dead bees near the hive; queen bee and brood remain.

2015 the White House released a “**National Strategy to Promote The Health of Honey Bees and Other Pollinators**”.

[<https://www.whitehouse.gov/blog/2015/05/19/announcing-new-steps-promote-pollinator-health>]

Honey bees pollinate crops such as apples, cranberries, melons, broccoli, blueberries, cherries... and almonds depend entirely on honey bees for pollination. (<http://www.abfnet.org>)



# Marine Environmental Sentinels...



Healthy Green Sea Turtle



Healthy coral reef



Fibropapillomatosis in a Green Sea Turtle (can obstruct swimming, feeding, buoyancy, sight, and can lead to death). There is a strong link between this disease and the environmental health of the coastal habitat.

[<http://www.cabi.org/isc/datasheet/82638>]



Unhealthy reef associated with oceanic acidification

[[http://coralreef.noaa.gov/education/oa/resources/22-4\\_kleypas.pdf](http://coralreef.noaa.gov/education/oa/resources/22-4_kleypas.pdf)]



# Disease CAN be prevented through healthier environments!

The realization of just how much disease and ill health can be prevented by focusing on environmental risk factors should add impetus to global efforts to encourage preventive measures through all available policies, strategies, interventions, technologies and knowledge.

The analysis shows that 23% of global deaths (and 26% of deaths among children under five) are due to modifiable environmental factors – and therefore can be prevented... **e.g. reduce air pollution, access to safe water, basic sanitation and access to clean fuel.**

## PREVENTING DISEASE THROUGH HEALTHY ENVIRONMENTS

A global assessment of the burden of disease from environmental risks

A Prüss-Ustün, J Wolf, C Corvalán, R Bos and M Neira

2016



# Climate Change...Paris Climate Conference Dec. 2015\*

195 countries adopted 1<sup>st</sup> ever universal, legally binding global climate deal to limit global warming to  $< 2^{\circ}\text{C}$  !!!



Tornados & Hurricanes



Floods



Rising sea levels



Melting Glaciers and Ice fields



Wild Fires



Droughts

\* You-tube video: [https://www.youtube.com/watch?v=5Tf5Hxa\\_dKs](https://www.youtube.com/watch?v=5Tf5Hxa_dKs)

# Health Risks from Climate Change

## White House Report - April 4, 2016

The report strengthens the scientific foundation for future decision making, allowing individuals, communities, organizations and governments to proactively manage the health risks of climate change with a One Health approach.

- Impacts on Air Quality - Air pollution and air borne allergens.
- **Changes in Extreme Heat and Extreme Cold.**
- More Frequent & Intense Extreme Events (e.g. drought, wildfires, flooding, hurricanes).
- **Altered Timing & Location of Vector-Borne Disease (e.g. Lyme Disease).**
- Increased Risks of Water-related Illnesses.
- **Increased Threats to Food Safety and Nutrition.**
- Adverse Impacts on Mental Health.
- **Disproportionate Effects on Vulnerable Populations.**

# Translational Biology... advancing One Health.

- The Institute of Medicine – Held a workshop in June 2015 entitled ***The Role of Clinical Studies for Pets with Naturally Occurring Tumors in Translational Cancer Research*** to examine the rationale and potential for an integrated comparative clinical trial approach to cancer drug development.

[<http://www.nationalacademies.org/hmd/Reports/2015/The-Role-of-Clinical-Studies-Pets-Naturally-Occurring-Tumors-Transitional-Cancer-Research.aspx>]

- **National Cancer Institute - Comparative Oncology Trials Consortium** - established to provide the infrastructure and resources needed to integrate clinical trials for pets with naturally occurring cancers into the development pathways for new drugs, devices, and imaging techniques for human cancers... while benefitting the lives of our pets.
- Currently **20 academic comparative oncology centers** are actively engaged in the NCI-COTC.

[<https://ccrod.cancer.gov/confluence/display/CCRCOPWeb/Comparative+Oncology+Trials+Consortium>]

# Members of the Comparative Oncology Trials Consortium

**Auburn University**  
Auburn, AL

**North Carolina State University**  
Raleigh, NC

**Tufts University**  
North Grafton, MA

**University of Guelph**  
Guelph, ON Canada

**University of Pennsylvania**  
Philadelphia, PA

**Colorado State University**  
Ft. Collins, CO

**Purdue University**  
West Lafayette, IN

**University of California**  
Davis, CA

**University of Illinois**  
Urbana, IL

**University of Tennessee**  
Knoxville, TN

**Kansas State University**  
Manhattan, KS

**Texas A&M University**  
College Station, TX

**University of Florida**  
Gainesville, FL

**University of Minnesota**  
St. Paul, MN

**University of Wisconsin**  
Madison, WI

**Michigan State University**  
East Lansing, MI

**The Ohio State University**  
Columbus, OH

**University of Georgia**  
Athens, GA

**University of Missouri**  
Columbia, MO

**Washington State University**  
Pullman, WA



## Canine tumors share similarities with human cancers in histologic appearance, tumor genetics, biologic behavior, molecular targets, therapeutic response, heterogeneity, acquired resistance, recurrence, and metastasis.



Dr. Rodney Page, Director, Flint Animal Cancer Center Colorado State University & NCI-COTC member. He lead the partnership with the IOM Workshop.



Scottish Terriers are 19 more times more likely to develop bladder cancer (Transitional Cell Carcinoma - BRAF gene mutation) than the average dog breed, accounts for 2% of all canine tumors and can affect up to 20,000 pets each year; this rate is similar to that seen in humans.



Why do elephants rarely develop cancer? Possibly because they have at least 20 copies (40 alleles) of TP53 (encodes for the protein p53), a crucial tumor suppressor gene, while humans only have 1 copy (2 alleles)... a look at evolutionary-based medicine. (Abegglen, L. et al. JAMA 10-8-15)

The gene expression profiles for canine and human osteosarcoma are indistinguishable, suggesting that findings from clinical trials for dogs with that type of cancer would be informative for human patients with osteosarcoma.



# Craniofacial reconstruction through regenerative technology.

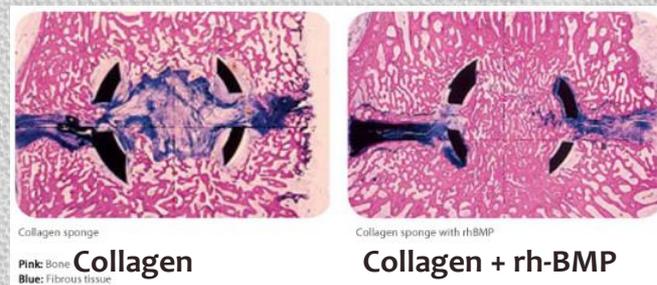
## One Health benefits for animals and people.

**Case example:** Dogs with a malignant or benign tumor of the jaw (mandible) often undergo surgery to remove a section of the diseased jaw (mandibulectomies); or in the case of trauma (e.g. car accidents) reconstruction of the jaw is needed in order to restore function.

- In the past, bone grafts were used but the results were far from ideal.
- FDA has approved 2 spinal fusion products for use in people consisting of **recombinant human bone morphogenetic proteins (rh-BMPs)** which are growth factors that help induce formation of bone and cartilage.
- Using titanium locking plates as a scaffold, rh-BMPs are combined with a collagen and calcium compression resistant matrix to achieve predictable and timely bone regeneration/reconstruction of the jaw.

(Frank J.M. Verstraete, Boaz Arzi, Daniel J. Huey, Derek D. Cissell and Kyriacos A. Athanasiou 2015  
<http://onlinelibrary.wiley.com/doi/10.1111/j.1532-950X.2014.12123.x/epdf>)

- Research that benefits animals and people!!



# Canine, Feline, and Human Obesity

**Health risk problems include: Type 2 diabetes\*, cardiorespiratory disease, musculoskeletal, and cancer.** \*Global public health issue – Diabetes has quadrupled world wide since 1980... today there are 422 million adults living with diabetes. (<http://who.int/mediacentre/news/releases/2016/world-health-day/en/#>)



**Optimal health for both humans and animals includes: Healthy Diets and Exercise.**



# Integrating One Health concepts into Academic Curriculums via One Health Case Studies.

The Association of American Veterinary Medical Colleges (AAVMC) + The Association for Prevention Teaching and Research (APTR) + Healthy People Curriculum Task Force (HPCTF) through the **One Health Inter-professional Education Initiative** developed **15 case studies** for integration into degree programs of health profession curriculums. (<http://www.aavmc.org/One-Health/Case-Studies.aspx> [2016])

Goal: To Help Students Acquire the Knowledge and Skills to Analyze:

- Mechanisms for potential transmission of human &/or animal disease.
- Options for prevention to avoid occurrence of animal & human diseases.
- Options for early detection & actions to avoid spread of animal & human diseases.
- Options to address health problems once disease is established in a population including inter-professional actions involving health care & public health systems.
- Impact on human health and responses to illness.
- Areas for ongoing study and potential application of One Health principles.



# 15 One Health Case Studies...



- **A Veteran and His Dog – Carbon monoxide poisoning.**
- ***Bordetella* Infections in Cystic Fibrosis Patients.**
- ***Staphylococcus pseudintermedius*: Look What the Dog Dragged In?**
- **Care of Immunocompromised Individuals: The Role of Companion Animals in Mental Health.**
- **Lead Poisoning.**
- **Pet Ownership. A variety of examples of benefits and risks.**
- **Q Fever (*Coxiella burnetii*).**
- ***Brucella suis*: A Re-emerging Pathogen at the Human, Livestock and Wildlife Interface.**
- **Of Dogs and Men: Methicillin-resistant *Staphylococcus aureus* (MRSA).**
- **Human-Animal Interaction. One Health Educational Framework.**
- **Chagas Disease (*Trypanosoma cruzi*): Connections between Humans, Animals and the Ecosystem.**
- **More Than Just Companions: Role of Animal Assisted Therapies in Prevention, Health, & Wellness.**
- **Animals, Humans, and the Environment in the Epidemiology of Chikungunya Virus.**
- **When Nature Strikes! An Unusual Infection (*Baylisascaris procyonis*) a Child from New Orleans.**
- **Pathomechanics of Degenerative Joint Disease: A One Health Comparative Case Study Approach.**

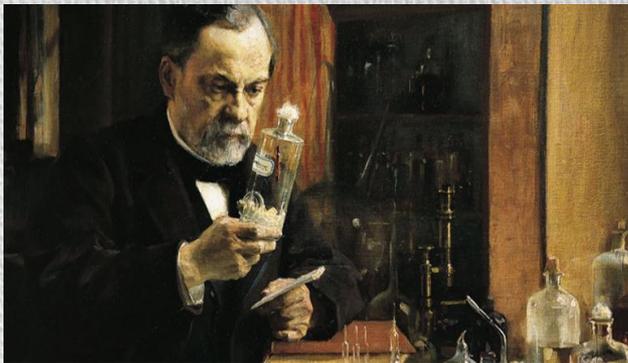
## Sir Alexander Fleming (1881 - 1955)

- 1928 discovered penicillin
- 1944 knighted
- 1945 awarded the Nobel Prize



Dr. Fleming cautioned that:

**“Resistance is a natural counterpart to antibiotics.”**



## Louis Pasteur (1822 – 1985)

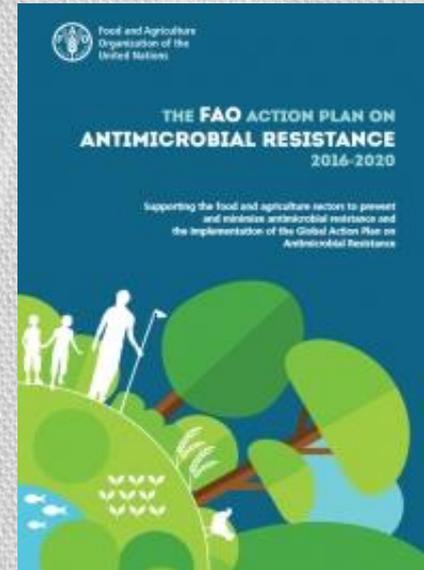
- Developed germ theory
- Created pasteurization
- Created vaccines for anthrax & rabies
- Developed fermentation

*“Messieurs, c’est les microbes qui auront le dernier mot.”* Louis Pasteur

**“Gentlemen, it is the microbes who will have the last word.”**

# Antimicrobial Resistance (AMR) – Global Concerns

- Dawn of antibiotic era was 7 decades ago – discovery of penicillin by Sir Alexander Fleming in 1928 – introduced as a therapeutic in 1943 but by 1947 there were penicillin resistant strains of bacteria. Today, AMR has become a major international concern... we live in a global village!!
- **AMR is outpacing the development of new countermeasures capable of thwarting infections.**
- AMR threatens patient care (human and animal), economic growth, public health, agriculture, economic security, and national security.
- **International travel increases opportunities for microbes to share genetic material and to spread globally.**
- Need to limit the use of antibiotics & discourage misuse... to help reduce selective pressure. Need to develop novel therapeutics.
- **We all need to be stewards of judicious use of our antibiotics!**



# September 2014 – Presidential Executive Order on Combating Antibiotic Resistant Bacteria

**The National Strategy** outlines **5 Goals** and Objectives:

1. Slow the emergence of resistant bacteria and prevent the spread of resistant infections.
2. Strengthen National **One-Health** surveillance efforts to combat resistance.
3. Advance development and use of rapid diagnostic tests for identification and characterization of resistant bacteria.
4. **Accelerate basic and applied research and development for new antibiotic, other therapeutics and vaccines.**
5. Improve international collaboration and capacities for antibiotic resistance prevention, surveillance, control, and antibiotic research and development.



# Benefits of Human – Animal Interactions





\* Food Security  
 \* Food Safety  
 \* Nutrition

\* Emerging Infectious Diseases  
 \* Antibiotic Resistance

Emergency Response

Bio/Agro-Terrorism

Global Health Security

# One Health Opportunities



Biomedical Research



\* Climate change  
 \* Planetary Health  
 \* Environmental Health

Mental Health

Disability

Occupational Health

Injuries



\* Obesity  
 \* Physical Activity



# Animal Biotechnology & One Health: Today's Summit

Animal biotechnology has been used to produce genetically engineered animals that synthesize therapeutic proteins, have improved growth rates, are resistant to disease, and have addressed specific animal welfare issues. Some have been approved while others are in an investigational phase.

**Pharmaceutical–therapeutic proteins:** Atryn (2009) – human anticoagulant protein produced in goat milk - purified and used as a therapeutic anticoagulant in humans;  
Kanuma (2015) – sebelipase alfa enzyme produced in chicken egg whites - purified and used as a treatment for patients with lysosomal acid lipase (LAL) deficiency; ***potential*** production of human lysozyme in goat milk to treat diarrheal disease in children (poorer communities in developing nations).

**Improved growth rates:** AquAdvantage salmon (2015) – reaches market size faster than non-engineered farm raised salmon.

**Disease resistant livestock:** ***potential*** - African swine fever; mastitis resistant cattle; avian influenza; avian leukosis virus; trypanosomiasis; bovine spongiform encephalopathy; grass carp hemorrhagic virus; porcine reproductive and respiratory syndrome virus; bovine tuberculosis; etc.

**Animal welfare:** ***potential*** - polled cattle (avoid painful dehorning).

Although **gene editing** has been around since the 1990s, using zinc-finger nucleases (ZFNs) and transcription activator–like effector nucleases (TALENs), the simplicity of the clustered regularly interspaced short palindromic repeats (CRISPR)-Cas tools introduced in 2012 has led to increased scientific attention, media coverage, and public interest. In July 2015 the White House Office of Science & Technology Policy stated it would revamp its protocols for GE crops and animals for the 1<sup>st</sup> time since 1992. In the last six months the FDA, EPA and USDA have all held public meetings to gather input on how gene editing is to be regulated.

# One Health Act of 2016 ...



An example of political action:

- Recently, a bill entitled the **One Health Act of 2016** (s.2634) was introduced in Congress. If this legislation is passed by Congress...
- ... it would require the Administration and Federal agencies to create a comprehensive strategy—the **National One Health Framework**—that will outline ways they can work together to address infectious diseases in animals and the environment, in order to prevent spread into human populations.
- ... it would also create competitive grant programs to carry out the programs outlined in the framework and spur collaboration between health programs at the state and local level.
- ... it would also urge international health organizations, like the World Bank and World Health Organization, to increase investments in One Health approaches to global health security.



# Crossing Bureaucratic Boundaries...

- **You** can be the agent of change.... first, seek to understand, then reach out to other disciplines to “bring the needed expertise to the table” in a collaborative effort to address the needs more efficiently, and often with an innovative approach not previously considered.
- Introduce One Health course materials into the educational forums.
- Engage policy/law makers from your local community, state, and federal levels to embrace a One Health collaborative, multidisciplinary approach to issues of mutual concern.
- Work with granting agencies (and government) to develop cross disciplinary research funding proposals that encourages collaboration and embraces innovative technologies.
- Encourage development of surveillance programs that can share data on global platforms.

# 2016 One Health Conferences this autumn...



## Save the date

### 2<sup>nd</sup> GLOBAL CONFERENCE ON ONE HEALTH

10<sup>th</sup> - 11<sup>th</sup> November 2016

Kitakyushu City, Fukuoka Prefecture, Japan

*Moving forward from One Health Concept to One Health Approach*

Following the successful Global Conference on One Health (GCOH) that was held in Madrid in May 2015, the WVA and WMA in close collaboration with the Japan Medical Association (JMA) and the Japan Veterinary Medical Association (JVMA) are preparing the 2<sup>nd</sup> GCOH to be held on **10<sup>th</sup>-11<sup>th</sup> November in Kitakyushu City, Fukuoka Prefecture, Japan.**

The 2<sup>nd</sup> GCOH aims to bring together Veterinarians, Physicians, Students, Public Health Officers, Animal Health Officers, NGOs and other interested parties from the different world regions to learn, discuss and to address critical aspects of the 'One Health' Concept.

The main objectives of the conference are to strengthen the links and communications and to achieve closer collaboration between Physicians, Veterinarians and all appropriate stakeholders to improve the different aspects of health and welfare of humans, animals and the environment.

The main conference sessions will focus on the issues of:

- Zoonotic diseases
- Foodborne diseases
- Antimicrobial resistance
- Environmental hazards exposure to humans and animals



European  
OneHealth / EcoHealth  
Workshop

Brussels, 6-7 October 2016



## One Health EcoHealth 2016

4-7 December 2016 - Melbourne Convention & Exhibition Centre

The 4th International One Health Congress & 6th Biennial Congress of the International Association for Ecology and Health





- One Health Day is an international campaign co-coordinated by the **One Health Commission**, the **One Health Initiative** Autonomous *pro bono* Team and the **One Health Platform Foundation**.
- The goal of One Health Day is to bring attention around the world to the need for One Health interactions and for the world to ‘see them in action’. The One Health Day campaign is designed to engage as many individuals as possible from as many arenas as possible in One Health education and awareness events, and to generate an inspiring array of projects worldwide.
- For more information about One Health Day, please contact:

E-mail: [Info@onehealthday.org](mailto:Info@onehealthday.org)

Internet: [https://www.onehealthcommission.org/en/eventscalendar/one\\_health\\_day/contact\\_us/](https://www.onehealthcommission.org/en/eventscalendar/one_health_day/contact_us/)

***“Science is far from a perfect instrument of knowledge.  
It’s just the best we have. In this respect it’s like democracy.”***

***Carl Sagan***

Those are the profound words of Dr. Carl Sagan, a man who was a brilliant communicator of science. His words remind us that science – like democracy – will change, develop and transform, but the direction it takes will always rest in our hands: shaped by our desire to contribute to a better world through a One Health approach... seeking optimal health for people, animals and our environment.

**Thank you!!**

FIRST ANNUAL



# one health DAY

**november 3, 2016**

Promoting efforts around the world to bring together  
all human, animal, and environmental health disciplines

*created and hosted by*



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