



**ONE HEALTH COMMISSION**



# One Health: Forming Collaborations that Transcend Disciplinary Boundaries



Cheryl Stroud, DVM, PhD  
Executive Director



# What is One Health all about?

**Not a new concept** .....

However it is .....

*A New  
Professional  
Imperative!!*



*Resurrecting our  
Ancient Wisdom*

“When one tugs at a single thing in **nature**, he finds it **attached** to the rest of the world.” John Muir - The Yosemite



Image by Gerd Altmann from [Pixabay](#)

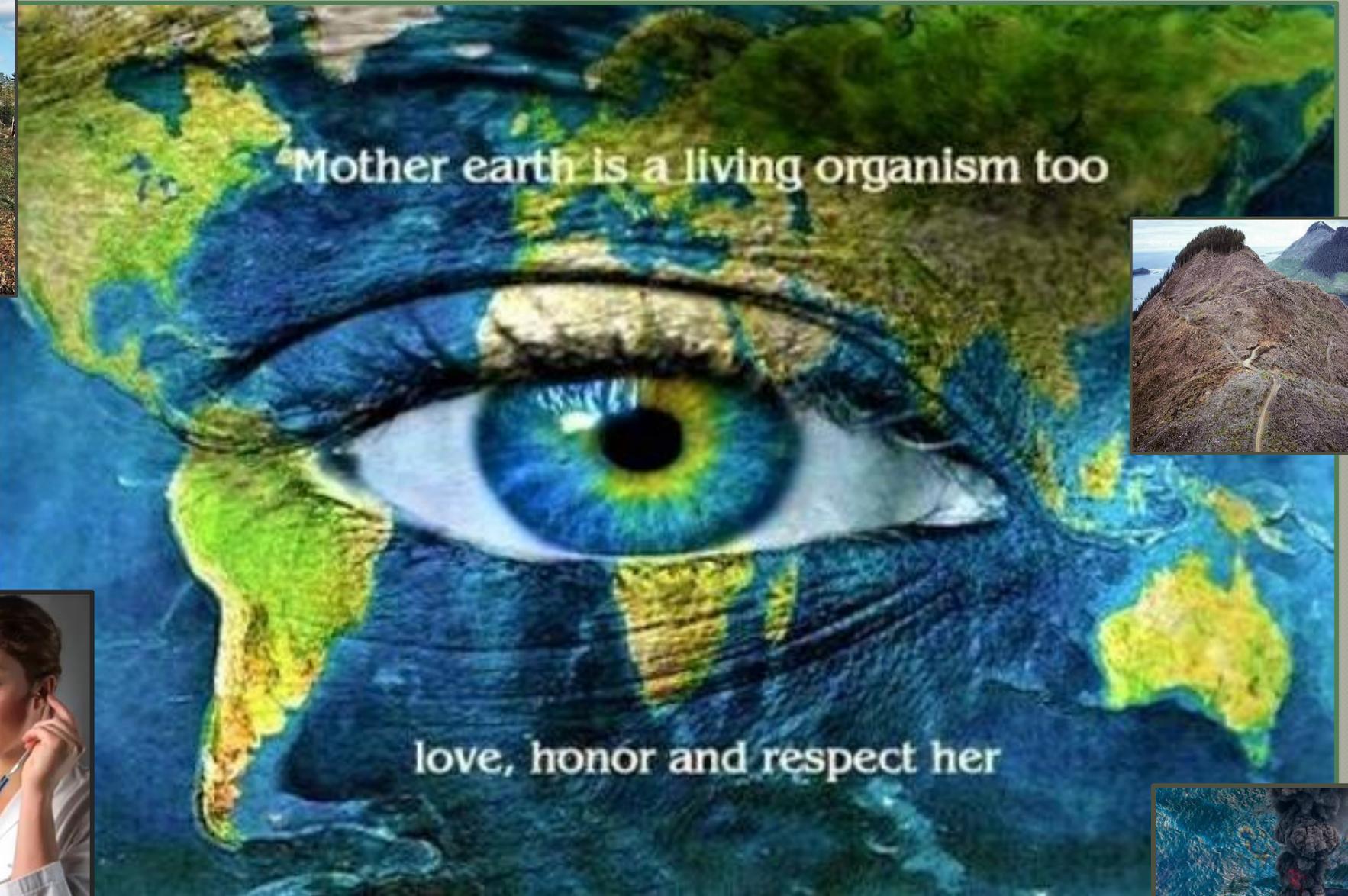


Image by Stefan Pavić from [Pixabay](#)



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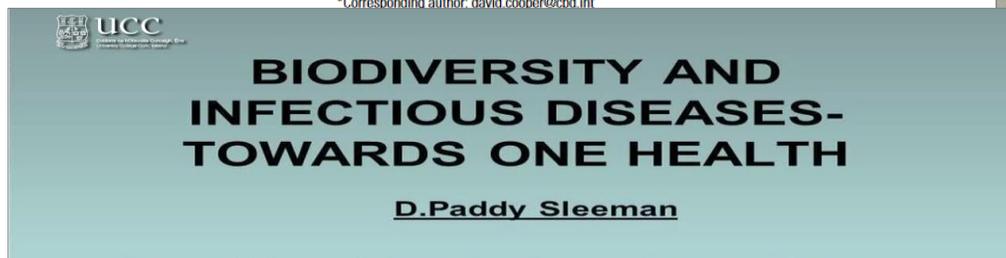
# Biodiversity – Biodiversidad

Rev. sci. tech. Off. int. Epiz., 2014, 33 (2), 487-496

## The integration of biodiversity into One Health

C. Romanelli, H.D. Cooper\* & B.F. de Souza Dias

Secretariat, Convention on Biological Diversity, 413 St Jacques, Suite 800, Montreal, H2Y1N9, Canada  
\*Corresponding author. david.cooper@cbd.int



## Understanding One Health and its relationship to biodiversity

Home / Articles & Research / Understanding One Health and its relationship to biodiversity

Topics: Human Wellbeing | Comments

Related Links



When we consider the concept of health, our understanding often changes based on our perception: A doctor would think of human health, a veterinarian of animal health and a conservationist of environmental health.

**Healthy Parks**  
**Healthy People Central**

Related Article

Understanding One Health and its relationship to biodiversity

Related Research

Understanding One Health and its relationship to biodiversity



Frontiers in One Health - Biodiversity Loss and the Rise of Emerging Infectious Diseases

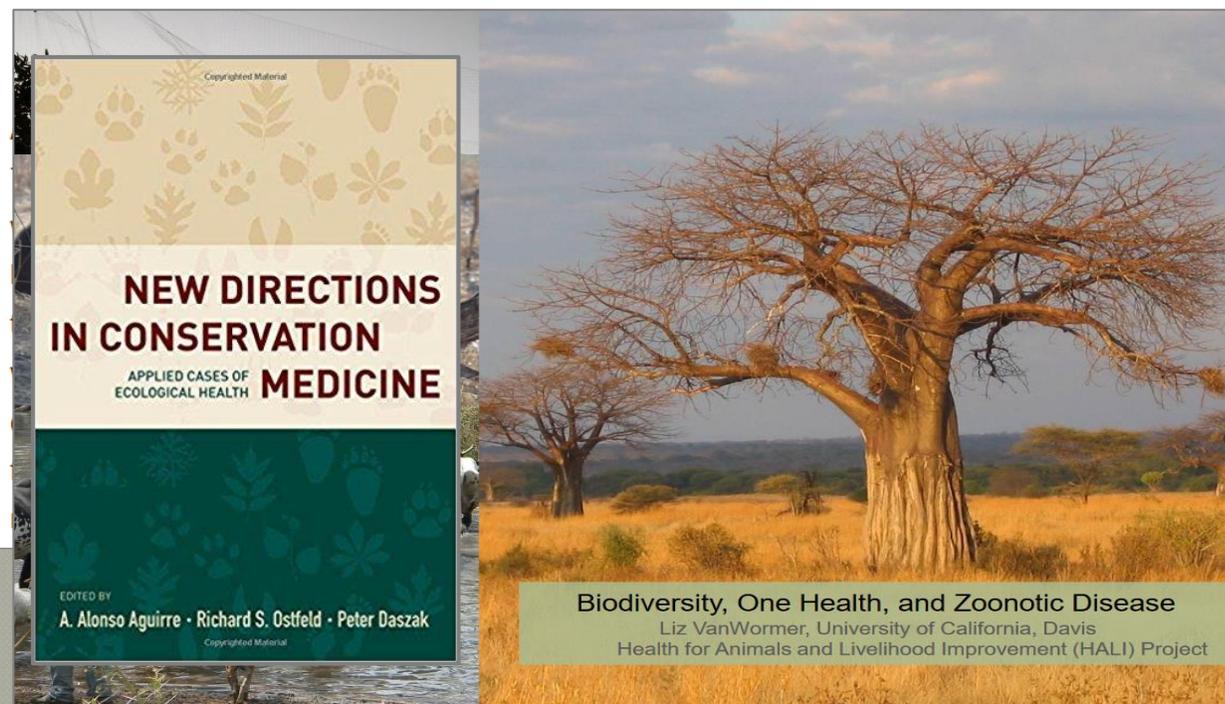
1,802 views

105

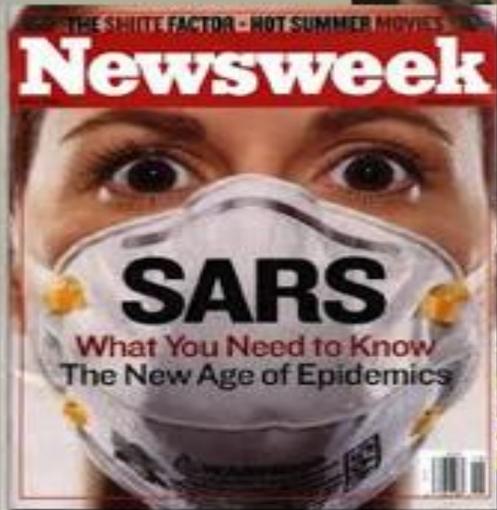
7 IUCNAEL EJournal

## ONE HEALTH AND BIODIVERSITY CONVENTIONS THE EMERGENCE OF HEALTH ISSUES IN BIODIVERSITY CONVENTIONS

Claire Lajaunie and Pierre Mazzega\*



# Zoonotic Diseases



# *Many faces (arenas in need) of One Health*

- Animals as Sentinels
- Antimicrobial Resistance
- Bio-Diversity /Conservation  
Medicine
- Climate Change
- Comparative Biology
- Disaster Preparedness / Relief
- Economics/Complex Systems, Civil Society
- Food / Water Safety / Security



- Human – Animal Bond
- Non-Communicable Diseases
- Plant & Soil Health
- Vector-borne Diseases /  
Climate Change
- Welfare / Well-being of  
animals, humans, planet
- Zoonotic Diseases



No one profession can know everything!

***Collaborations***

start with

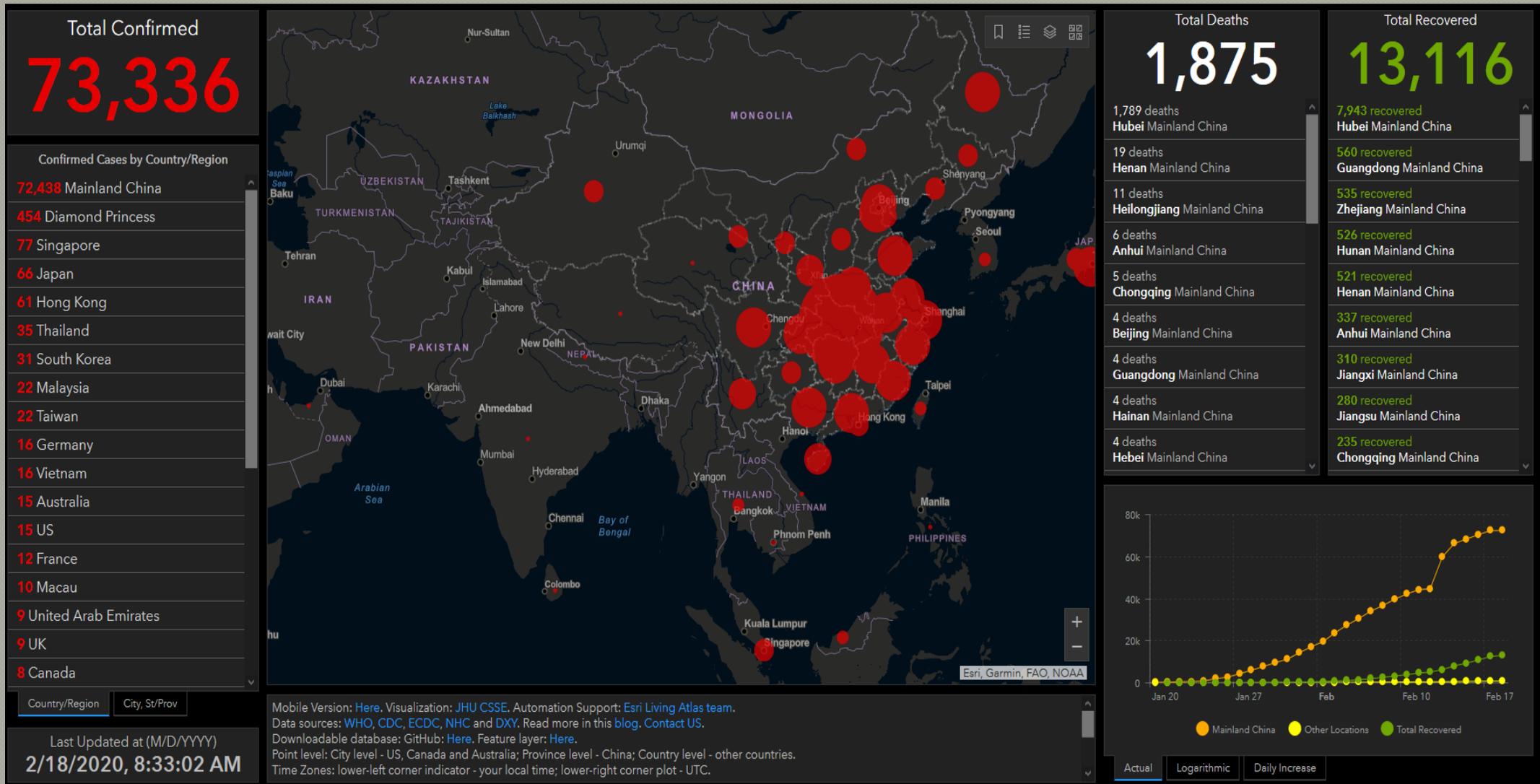
***Relationships!!***

*Which start when we  
come together in direct conversations*



# Coronavirus COVID-19 Global Cases by Johns Hopkins Center for Systems Science and Engineering (CSSE)

February 18, 2020



# Coronavirus COVID-19 Global Cases by Johns Hopkins Center for Systems Science and Engineering (CSSE)

April 25, 2020

COVID-19 Dashboard by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University (JHU)

Total Confirmed  
**2,840,830**

Confirmed Cases by Country/Region /Sovereignty

- 907,096 US
- 223,759 Spain
- 192,994 Italy
- 159,952 France
- 155,418 Germany
- 149,554 United Kingdom
- 104,912 Turkey
- 89,328 Iran
- 83,901 China
- 74,588 Russia
- 54,043 Brazil
- 45,325 Belgium
- 44,127 Canada
- 37,384 Netherlands
- 28,894 Switzerland
- 24,942 India

23,282 Portugal  
Admin0 Admin1 Admin2

Last Updated at (M/D/YYYY)  
**4/25/2020, 10:31:20 AM**



Cumulative Confirmed Cases Active Cases Incidence Rate Case-Fatality Ratio Testing Rate Hospitalization Rate

**185**  
countries/regions

Lancet Inf Dis Article: [Here](#). Mobile Version: [Here](#).  
Lead by JHU CSSE. Automation Support: Esri Living Atlas team and JHU APL. Contact US. FAQ.

Data sources: WHO, CDC, ECDC, NHC, DXY, 1point3acres, Worldometers.info, BNO, the COVID Tracking Project (testing and hospitalizations), state and national government health departments, and local media reports. Read more in this [blog](#).

Total Deaths  
**199,272**

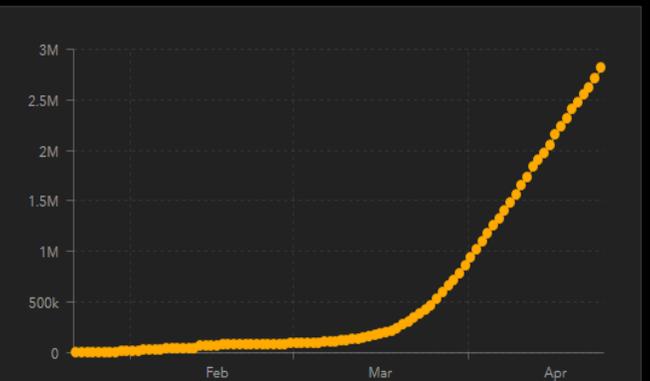
- 25,969 deaths Italy
- 22,902 deaths Spain
- 22,245 deaths France
- 20,319 deaths United Kingdom
- 16,646 deaths New York City **New York US**
- 6,917 deaths Belgium
- 5,802 deaths Germany
- 5,650 deaths

Deaths Recovered

Total Test Conducted in U.S.  
**4,940,376**

- 730,656 tested New York US
- 494,173 tested California US
- 319,038 tested Florida US
- 242,547 tested Texas US
- 215,213 tested Massachusetts US
- 205,962 tested New Jersey US
- 189,632 tested Illinois US
- 186,143 tested Pennsylvania US

US Tested US Hospitalization



Confirmed Logarithmic Daily Cases

# Coronavirus COVID-19 Global Cases by Johns Hopkins Center for Systems Science and Engineering (CSSE)

June 25, 2020

COVID-19 Dashboard by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University (JHU)

Total Confirmed  
**9,478,266**

Confirmed Cases by Country/Region /Sovereignty

2,388,865	US
1,188,631	Brazil
613,148	Russia
473,105	India
308,337	United Kingdom
264,689	Peru
254,416	Chile
247,486	Spain
239,410	Italy
215,096	Iran
197,885	France
196,847	Mexico
193,371	Germany
192,970	Pakistan
191,657	Turkey
170,639	Saudi Arabia



Global Deaths

**483,613**

122,071 deaths	US
53,830 deaths	Brazil
43,165 deaths	United Kingdom
34,644 deaths	Italy
29,734 deaths	France
28,330 deaths	Spain
24,324 deaths	Mexico
14,894 deaths	

US State Level Deaths, Recovered

31,257 deaths, <b>69,710 recovered</b>	New York US
13,076 deaths, <b>29,627 recovered</b>	New Jersey US
7,937 deaths, <b>recovered</b>	Massachusetts US
6,770 deaths, <b>recovered</b>	Illinois US
6,518 deaths, <b>64,502 recovered</b>	Pennsylvania US
6,114 deaths, <b>49,290 recovered</b>	Michigan US
5,726 deaths, <b>recovered</b>	California US
4,287 deaths, <b>7,842 recovered</b>	



Admin0 Admin1 Admin2  
Last Updated at (M/D/YYYY)  
**6/25/2020, 11:33:52 AM**

**188** countries/regions

Lancet Inf Dis Article: [Here](#). Mobile Version: [Here](#).  
Lead by JHU CSSE. Technical Support: [Esri Living Atlas team](#) and [JHU APL](#). Financial Support: [JHU](#) and [NSF](#). Click [here](#) to donate to the CSSE dashboard team, and other JHU COVID-19 Research Efforts. [FAQ](#). Read more in this [blog](#). [Contact US](#).

Data sources: WHO, CDC, ECDC, NHC, DXY, 1point3acres, Worldometers.info, the COVID Tracking Project (testing and

# Coronavirus COVID-19 Global Cases by Johns Hopkins Center for Systems Science and Engineering (CSSE)

September 8, 2020

COVID-19 Dashboard by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University (JHU)

Global Cases  
**27,332,433**

Cases by Country/Region/Sovereignty

6,300,727	US
4,204,613	India
4,147,794	Brazil
1,027,334	Russia
689,977	Peru
666,521	Colombia
639,362	South Africa
637,509	Mexico
525,549	Spain
488,007	Argentina
424,274	Chile
388,810	Iran
367,174	France
352,451	United Kingdom
327,359	Bangladesh
321,456	Saudi Arabia
299,233	Pakistan



Global Deaths

**891,308**

189,206 deaths	US
126,960 deaths	Brazil
71,642 deaths	India
67,781 deaths	Mexico
41,643 deaths	United Kingdom
35,553 deaths	Italy
30,732 deaths	France
29,838 deaths	

US State Level Deaths, Recovered

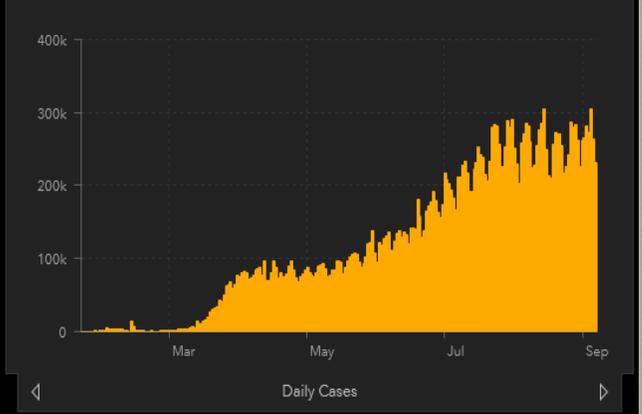
33,002 deaths, <b>75,471 recovered</b>	New York US
15,991 deaths, <b>34,202 recovered</b>	New Jersey US
13,758 deaths, <b>recovered</b>	California US
13,697 deaths, <b>543,412 recovered</b>	Texas US
11,871 deaths, <b>recovered</b>	Florida US
9,133 deaths, <b>105,769 recovered</b>	Massachusetts US
8,398 deaths, <b>recovered</b>	Illinois US
7,771 deaths, <b>114,687 recovered</b>	

Last Updated at (M/D/YYYY)  
**9/8/2020, 12:28 AM**

Cumulative Cases | Active Cases | Incidence Rate | Case-Fatality Ratio | Testing Rate

**188**  
countries/regions

Lancet Inf Dis Article: [Here](#). Mobile Version: [Here](#). Data sources: [Full list](#). Downloadable database: [GitHub](#), [Feature Layer](#). Lead by [JHU CSSE](#). Technical Support: [Esri Living Atlas team](#) and [JHU APL](#). Financial Support: [JHU](#), [NSF](#), [Bloomberg Philanthropies](#) and [Stavros Niarchos Foundation](#). Resource support: [Slack](#), [Github](#) and [AWS](#). Click [here](#) to **donate** to the CSSE dashboard team, and other JHU COVID-19 Research Efforts. [FAQ](#). Read more in this [blog](#). [Contact US](#).



# Coronavirus COVID-19 Global Cases by Johns Hopkins Center for Systems Science and Engineering (CSSE)

September 25, 2020

COVID-19 Dashboard by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University (JHU)

Global Cases

**32,406,883**

Cases by Country/Region/Sovereignty

- 7,027,910 US
- 5,818,570 India
- 4,657,702 Brazil
- 1,131,088 Russia
- 798,317 Colombia
- 788,930 Peru
- 716,481 Spain
- 715,457 Mexico
- 678,266 Argentina
- 668,529 South Africa
- 552,311 France
- 453,868 Chile
- 439,882 Iran
- 425,765 United Kingdom
- 356,767 Bangladesh
- 341,699 Iraq
- 332,329 Saudi Arabia

Admin0 Admin1 Admin2

Last Updated at (M/D/YYYY)

**9/25/2020, 7:23 PM**



Cumulative Cases Active Cases Incidence Rate Case-Fatality Ratio Testing Rate

**188**

countries/regions

Lancet Inf Dis Article: [Here](#). Mobile Version: [Here](#). Data sources: [Full list](#). Downloadable database: [GitHub](#), [Feature Layer](#). Lead by JHU CSSE. Technical Support: [Esri Living Atlas team](#) and [JHU APL](#). Financial Support: [JHU](#), [NSF](#), [Bloomberg Philanthropies](#) and [Stavros Niarchos Foundation](#). Resource support: [Slack](#), [Github](#) and [AWS](#). Click [here](#) to **donate** to the CSSE dashboard team, and other JHU COVID-19 Research Efforts. [FAQ](#). Read more in this [blog](#). [Contact US](#).

Global Deaths

**985,791**

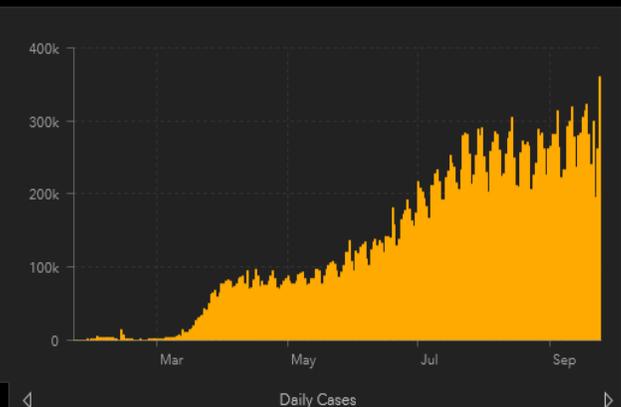
- 203,571 deaths US
- 139,808 deaths Brazil
- 92,290 deaths India
- 75,439 deaths Mexico
- 42,025 deaths United Kingdom
- 35,801 deaths Italy
- 31,938 deaths Peru
- 31,674 deaths

Global Deaths

US State Level Deaths, Recovered

- 33,102 deaths, **76,456 recovered** New York US
- 16,097 deaths, **34,650 recovered** New Jersey US
- 15,588 deaths, **646,143 recovered** Texas US
- 15,481 deaths, **recovered** California US
- 13,915 deaths, **recovered** Florida US
- 9,373 deaths, **111,479 recovered** Massachusetts US
- 8,807 deaths, **recovered** Illinois US
- 8,065 deaths, **126,446 recovered**

US Deaths, Recovered



Daily Cases

# Popular media OpEds and Commentaries about the coronavirus outbreak / pandemic that mention and/or call for One Health by name or theory.

## COVID-19 and One Health

Image: CDC/ Alissa Eckert, MS; Dan Higgins

### COVID-19 and ONE HEALTH

Since January 2020 this page has been compiling popular media OpEds, Commentaries, Podcasts and other media about the coronavirus outbreak / pandemic that mention and/or call for One Health by name or theory. If you know of such articles not yet listed here, please send them to [ohc@onehealthcommission.org](mailto:ohc@onehealthcommission.org).

Many more in the queue; Check back frequently.

To see peer reviewed scientific articles visit the Commission's online One Health Library [Journal Articles/White Papers](#) Section.

See also: [COVID-19 One Health Lessons for Ages 6-18+](#)

#### June 2020

- Jun 17 [Act fast to avoid next pandemic, warns WWF](#)  
Author: IANS In: Outlook India
- Jun 17 [Wildlife Supply Chains for Human Consumption Increase Coronaviruses' Spillover Risk to People](#)  
Author: Wildlife Conservation Society In: News Wise

Over 150 articles and the list is growing >>>>>

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

[https://www.onehealthcommission.org/en/news/covid19\\_and\\_one\\_health/](https://www.onehealthcommission.org/en/news/covid19_and_one_health/)

# Teaching One Health with Stories

## Young Woman Travel Writer



Ecuador's Tungurahua volcano  
Photograph by Guillermo Granja, Reuters



Anonymous Image  
Veterinary Medicine, Mind over Miller, July 2011



Anonymous Image

- Two weeks after returning home:
  - swollen painful joints
  - fever
  - skin lesions
  - discolored fingernails
  - shortness of breath
- Radiographs => lung lesions
- Granulomatous visceral lesions



Anonymous Image

Two years - 76 specialists – and 10 CT scans later

**Tentative Diagnoses:**

**Hodgkin's Lymphoma**

**Non-Hodgkin's Lymphoma**

**Scabies, scleroderma**

**Gastrointestinal stromal tumors (GIST)**

**Scheduled for exploratory surgery for  
GIST, thought most likely to be sarcoma**

**Blood sample to Dr. Ed Breitschwerdt  
at the at the CSU Vet School who  
found .....**





Anonymous Image

Two years - 76 specialists – and 10 CT scans later

Tentative Diagnoses:

Hodgkin's Lymphoma

Non-Hodgkin's Lymphoma

Scabies, scleroderma

Gastrointestinal stromal tumors (GIST)

Scheduled for exploratory surgery for  
GIST, thought most likely to be sarcoma

Blood sample to Dr. Ed Breitschwerdt  
at the at the CSU Vet School who  
found .....

**Bartonella vinsonii**





After surgery - the surgeon reported to father  
- found no evidence of malignancy.

Father answered, "I never thought she had a  
malignancy...(I believe) she has Bartonellosis'.

Surgeon replied: "I'm a surgeon.  
I don't know what bartonellosis is."

**!! We need for a way to exchange information  
Across professions!!**

Veterinary Medicine, Mind over Miller, July 2011

<https://www.dvm360.com/view/mind-over-miller-are-we-too-specialized-part-1-human-medicine>



# What *IS* Bartonellosis?

## A hidden epidemic?

Trench fever – World War II  
Cat Scratch Fever  
But it's Way more.....

A zoonotic Vector-Borne disease recently recognized to be prominent in humans as well as animals, causing a range of abnormalities including cardiac, neurologic and degenerative joint disease. Bartonella is a vector-borne spirochete bacteria carried by many arthropod insects including fleas, ticks and lice. It can become chronically, deeply embedded in all tissues. Some researchers consider this disease to be a hidden epidemic.



Robert Mozayeni, MD

### ***Bartonella* spp. Bacteremia and Rheumatic Symptoms in Patients from Lyme Disease–endemic Region**

Ricardo G. Maggi, B. Robert Mozayeni, Elizabeth L. Pultorak, Barbara C. Hegarty, Julie M. Bradley, Maria Correa, and Edward B. Breitschwerdt

Emerging Infectious Diseases • [www.cdc.gov/eid](http://www.cdc.gov/eid) • Vol. 18, No. 5, May 2012

#### 296 Patients examined by a rheumatologist:

- 62% (185) had antibodies to *B. henselae*, *B. koehlerae* or *B. vinsonii*
- 41% had *Bartonella* species bacteremia

#### Conditions diagnosed before referral:

- Lyme disease (46.6%)
- Arthralgia/ Rheumatoid arthritis (20.6 %)
- Chronic fatigue (19.6%)
- Fibromyalgia (6.1%)
- Blurred vision / neurologic deficits
- Numbness in extremities

# Example of Successful One Health Collaborations across disciplines.

## Welcome to the Webinar



## Understanding Bartonella: A One Health Perspective

The broadcast will begin momentarily



<https://www.youtube.com/watch?v=uYEHsRRxrQw&feature=youtu.be>

## Session Presenters



### **Bartonellosis: A One Health Approach to an Emerging Infectious Disease**

**Edward B. Breitschwerdt, DVM**

Professor of Medicine and Infectious Diseases

College of Veterinary Medicine, North Carolina State University

Adjunct Professor of Medicine, Duke University Medical Center

Chief Scientific Officer, Galaxy Diagnostics



### **Bartonella: Clinical Expression of Small Vessel Inflammation**

**B. Robert Mozayeni, MD**

Translational Medicine Group, P.C.

Foundation for Study of Inflammatory Diseases (a non-profit)

Chief Medical Officer, Galaxy Diagnostics

See also: The People's Pharmacy interview of the two of them together.

[Ticks, Fleas and Mysterious Disease, The People's Pharmacy Radio Podcast, August 2014 \[June 2013\]](https://www.peoplespharmacy.com/store/radio-shows/show-907-ticks-fleas-mystery-disease/)

<https://www.peoplespharmacy.com/store/radio-shows/show-907-ticks-fleas-mystery-disease/>

# What IS Bartonellosis? A hidden epidemic?

DIAGNOSTIC TESTING LAB – DEPARTMENT OF CLINICAL SCIENCES

## Intracellular Pathogens Research Lab

Contact us: ☎ 919.513.8281 | ✉ [jmbradl3@ncsu.edu](mailto:jmbradl3@ncsu.edu)

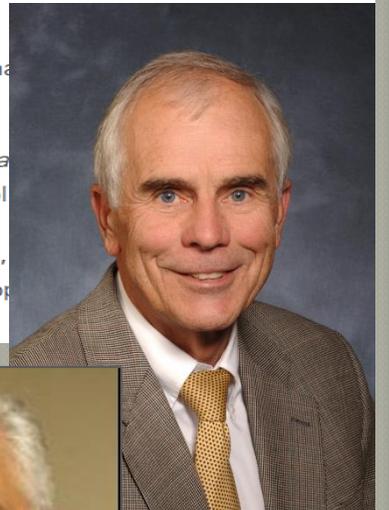
**NC STATE** Veterinary Medicine

[Overview](#) | [Sponsors](#) | [Research Team](#) | [Research](#) | [Publications](#) | [Resources](#)  
<https://tinyurl.com/s694w87>

[Bartonella Research Publications: Intracellular Pathogens Research Laboratory](#) ▾  
[Human Bartonella Research Publications Intracellular Pathogens Research Laboratory](#) ▴

### Human *Bartonella* Research Publications Intracellular Pathogens Research Laboratory

1. [Bartonella Research North Carolina](#)
2. [Holson: Isolation of \*Bartonella\* from a patient with animal and arthropod exposure. J Clin Microbiol](#)



Value of One Health: Saving Lives

***Bartonella henselae* Bloodstream Infection in a Boy With Pediatric Acute-Onset Neuropsychiatric Syndrome**

Edward B Breitschwerdt<sup>1</sup> , Rosalie Greenberg<sup>2</sup>, Ricardo G Maggi<sup>1</sup>, B Robert Mozayeni<sup>3</sup>, Allen Lewis<sup>4</sup> and Julie M Bradley<sup>1</sup>

Journal of Central Nervous System Disease  
Volume 11: 1-8  
© The Author(s) 2019  
Article reuse guidelines:  
sagepub.com/journals-permission  
DOI: 10.1177/117957351983  


Clin Rheumatol  
DOI 10.1007/s10067-016-3524-2



BRIEF REPORT

**Culture, PCR, DNA sequencing, and second harmonic generation (SHG) visualization of *Bartonella henselae* from a surgically excised human femoral head**

M. Ericson<sup>1</sup> • N. Balakrishnan<sup>2</sup> • B.R. Mozayeni<sup>3</sup> • C.W. Woods<sup>4,5</sup> • J. Dencklau<sup>1</sup> • S. Kelly<sup>6</sup> • E. B. Breitschwerdt<sup>2</sup>

Ashdi  
Journal of Neuroparasitology  
Vol. 3 (2012), Article ID 235640, 15 pages  
doi:10.4303/jnp/235640



Review Article  
**Neurological Manifestations of Bartonellosis in Immunocompetent Patients: A Composite of Reports from 2005–2012**

PLoS Negl Trop Dis. 2015 Jan 15;9(1):e0003467. doi: 10.1371/journal.pntd.0003467. eCollection 2015 Jan.

***Bartonella* spp. bacteremia in blood donors from Campinas, Brazil.**

VECTOR-BORNE AND ZOOLOGICAL DISEASES  
Volume 14, Number 8, 2014  
© Mary Ann Liebert, Inc.  
DOI: 10.1089/vbz.2013.1512

**Detection of *Bartonella* Species in the Blood of Veterinarians and Veterinary Technicians: A Newly Recognized Occupational Hazard?**



Fig. 2 Radiograph of the right hip joint (March 2015, pre-surgical) documenting degenerative osteoarthrosis (a). Post-surgical radiograph (August 2015), illustrating right hip joint replacement with

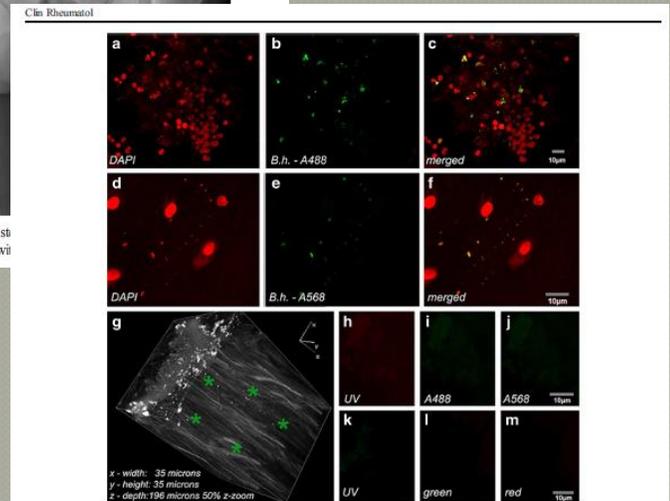


Fig. 3 Using single- and multi-photon confocal microscopy, *Bartonella henselae* organisms were visualized in spongy and compact bone of the patient's resected femoral head. a-c Spongy bone using Alexa 488 fluorophore reveals co-localization of DAPI nuclear staining (a—red) and immunoreactive *B. henselae* (b—green) and merged image (c—yellow). d-f Compact bone using Alexa 568 fluorophore shows co-localization of DAPI nuclear staining (d—red) and immunoreactive *B. henselae* (e—green) and merged image (f—yellow). g This 3-D projection, captured with second harmonic generation imaging (SHG), reveals *B. henselae* organisms (bright white dots, asterisks) are abundant in the cancellous bone and sparse within the parallel collagen fibrils of the deep articular surface that run perpendicular to the articular surface. h-j No non-specific binding by secondary antibodies was observed. k-m No endogenous tissue fluorescence was observed.

# Animals as Sentinels



## **Elevated PBDE Levels in Pet Cats: Sentinels for Humans?**

*Environ. Sci. Technol.* 2007, 41, 6350–6356

JANICE A. DYE,\* ,† MARTA  
LINGYAN ZHU,‡ ,|| CYNTHIA R. WARD,§  
RONALD A. HITES,‡ AND  
LINDA S. BIRNBAUM†

[Environ Health Perspect.](#) 2012; 120(7):1049-54.

Research | Children's Health and

## **Serum PBDEs in a North Carolina Toddler Cohort: Associations with Handwipes, House Dust, and Socioeconomic Variables**

*Heather M. Stapleton,<sup>1</sup> Sarah Eagle,<sup>1</sup> Andreas Sjödin,<sup>2</sup> and Thomas F. Webster<sup>3</sup>*

<sup>1</sup>Nicholas School of the Environment, Duke University, Durham, North Carolina, USA; <sup>2</sup>Centers for Disease Control

[Environ Res.](#) 2016 Nov;151:145-153. doi: 10.1016/j.envres.2016.07.027. Epub 2016 Jul 29.

**U.S. domestic cats as sentinels for perfluoroalkyl substances: Possible linkages with housing,  
obesity, and disease.**

[Bost PC<sup>1</sup>](#), [Strynar MJ<sup>2</sup>](#), [Reiner JL<sup>3</sup>](#), [Zweigenbaum JA<sup>4</sup>](#), [Secoura PL<sup>5</sup>](#), [Lindstrom AB<sup>2</sup>](#), [Dye JA<sup>6</sup>](#).

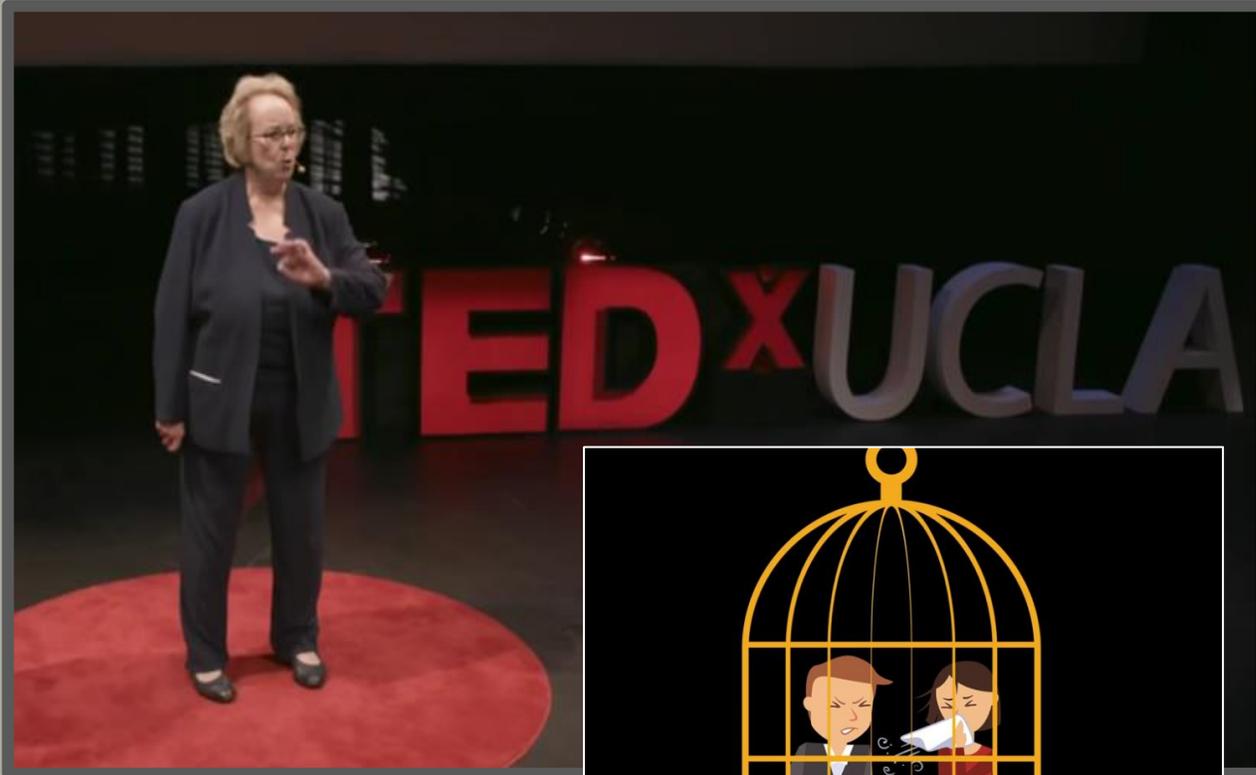


Hyperthyroid cats

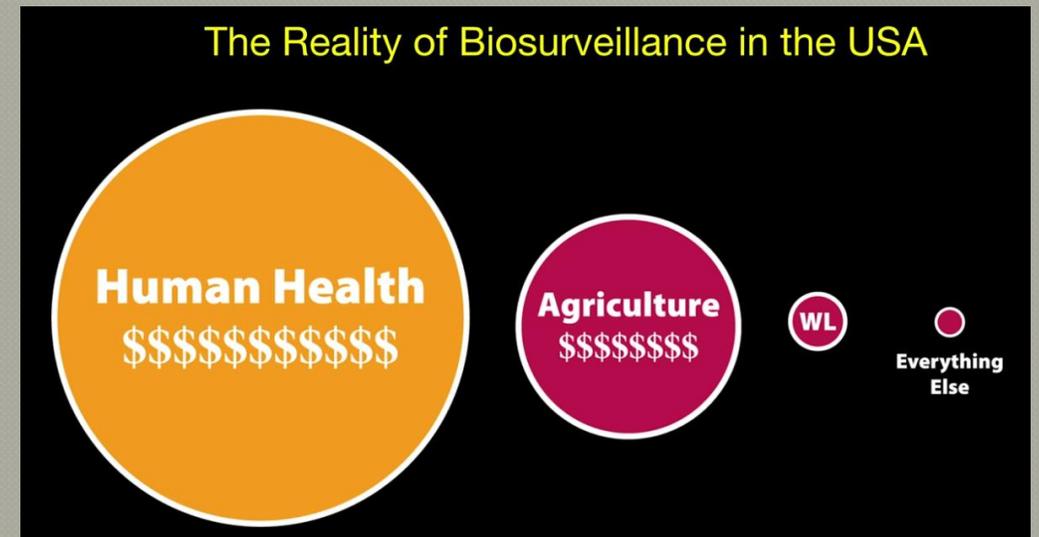
# Human?? as Sentinels

## The 1999 West Nile Story in the US

Tracy McNamara: (Human) Canaries in the Coal Mine



Our current funding structures are the opposite of One Health. They virtually guarantee that we will not find an emerging zoonotic threat until we have people in emergency rooms or bodies in the morgue.



# Human?? as Sentinels

Does it matter that in cities around the US, all the animals (shelters, wildlife, pets) do not fall under Jurisdiction of 'Any' federal agencies and therefore are not under any form of surveillance?

## Does it Matter????

Yes!!!!!!.....

## Why?



# Stark Reminders - why we urgently Need to implement One Health

“The threats we face today have changed and evolved..... but our systems have not. We are left with a species gap. CDC focuses on human diseases; ..... it does not do animal diseases.”

**“What if?”**

What if that flu in cats in a shelter in New York in 2017 had turned out to be like the 1918 flu pandemic? What if the zoonotic coronavirus we are facing today turns into a similar pandemic?

**We are missing** what is right in front of our noses....

.....All the animals in our environment.

In the US right now we are looking for aerosolized bacteria ..... and *dead people*.

**We are using taxpayers as ‘sentinels’.**



# Economics of One Health: Costs and benefits of integrated West Nile virus surveillance in Emilia-Romagna

Giulia Paternoster , Sara Babo Martins, Andrea Mattivi, Roberto Cagarelli, Paola Angelini, Romeo Bellini, Annalisa Santi, Giorgio Galletti, Simonetta Pupella, Giuseppe Marano, Francesco Copello, Jonathan Rushton, Katharina D. C. Stärk, Marco Tamba

Published: November 27, 2017 • <https://doi.org/10.1371/journal.pone.0188156>

<http://bit.ly/2CHYQml>



PREDICT



**Prevent, Prepare and Respond:  
Economics of One Health to Confront Disease Threats**  
30 January – 2 February 2017

Workshop Report



*Trans R Soc Trop Med Hyg* 2017; **111**: 235–237  
doi:10.1093/trstmh/trx039

## One Health Economics to confront disease threats

Catherine Machalaba<sup>a</sup>, Kristine M. Smith<sup>a</sup>, Lina Awada<sup>b</sup>, Kevin Berry<sup>c</sup>, Franck Berthe<sup>d</sup>, Timothy A. Bouley<sup>d</sup>,

One Health 7 (2019) 100080

Contents lists available at ScienceDirect

One Health

journal homepage: [www.elsevier.com/locate/onehlt](http://www.elsevier.com/locate/onehlt)



ELSEVIER



Infectious disease and economics: The case for considering multi-sectoral impacts

Kristine M. Smith<sup>a</sup>, Catherine C. Machalaba<sup>a,b</sup>, Richard Seifman<sup>c</sup>, Yasha Feferholtz<sup>a</sup>, William B. Karesh<sup>a,d,\*</sup>

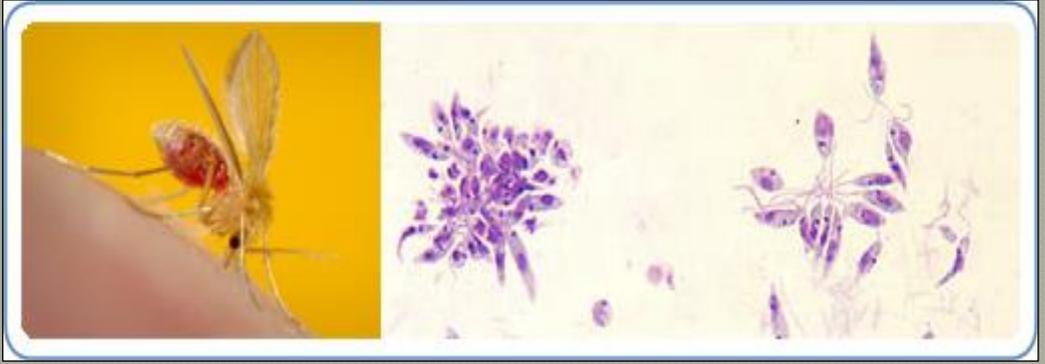
COMMENTARY

Download

# Vector-borne Diseases



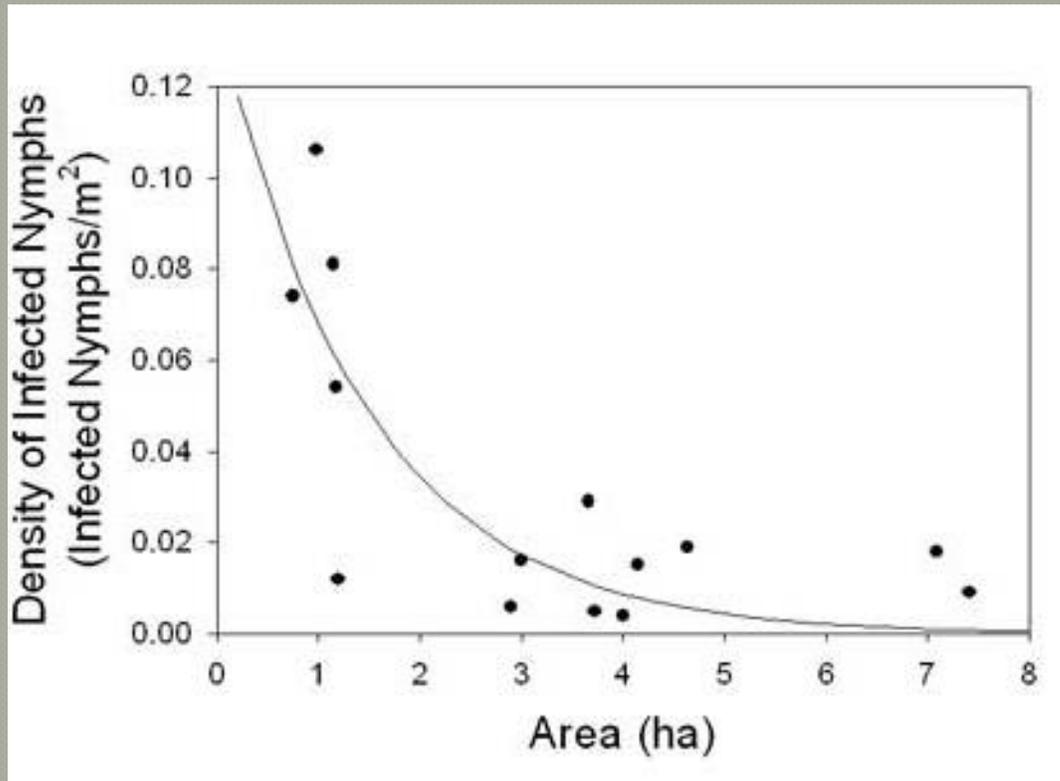
- Anaplasmosis
- Babesiosis
- Bartonellosis
- Borreliosis (Lyme Disease)
- Leishmaniasis (cutaneous / visceral)
- Rocky Mountain Spotted Fever
- West Nile Virus
- Yellow Fever
- Zika Virus
- Ect.....



<http://www.cbsnews.com/pictures/10-most-terrifying-parasites-ever/8/>

# Human, Animal, Environment Triumvirate

## How our human actions have contributed to Lyme disease: Forest fragmentation and Lyme disease risk



White-footed mice are highly resilient to habitat fragmentation and destruction and increase in population density when other vertebrate or natural predator populations diminish or disappear.

Examine the graph on the left. Note:

What is the relationship between forest patch area (X-axis) and density of infected nymphs (Y-axis)?

What would explain these findings?

Given these results, explain why Lyme disease risk is so high in some U.S. states.

What strategies could these states implement to reduce Lyme disease risk?

# Animals as Sentinels

## Human, Animal, and Ecosystem Health

### Why are Lyme Disease Rates So High In Some States?



Tick on a human

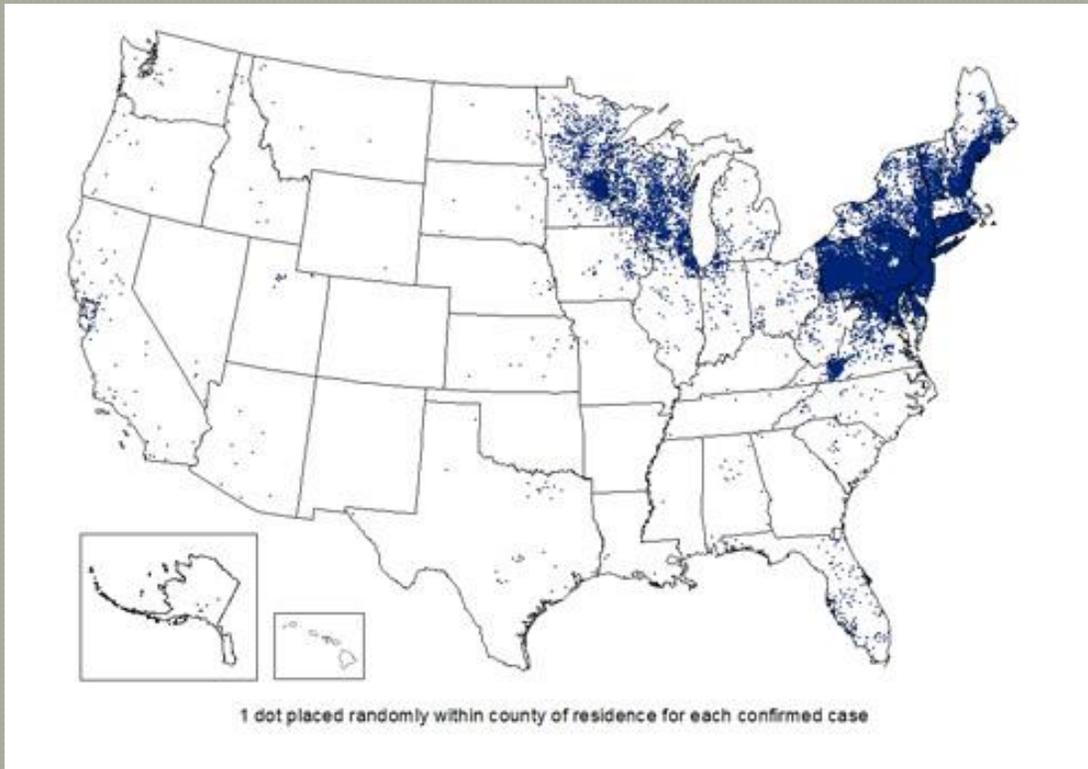


Ticks on a dog

[http://www.momjunction.com/articles/lyme-disease-in-toddlers\\_00362985/#gref](http://www.momjunction.com/articles/lyme-disease-in-toddlers_00362985/#gref)

<http://aetapet.com/lyme-disease-dogs/>

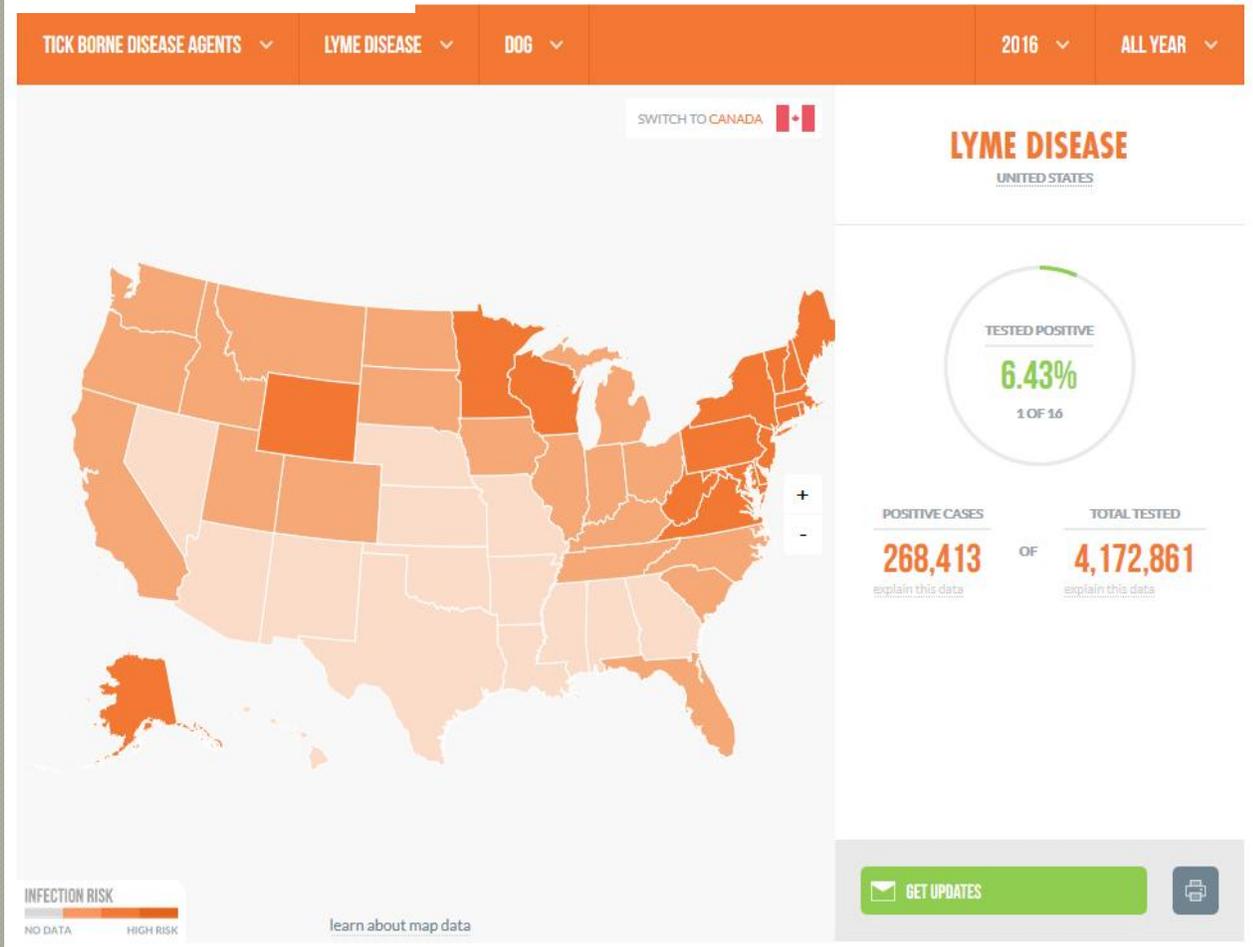
# Borreliosis – Humans - 2016



<https://www.cdc.gov/lyme/stats/maps.html>

In 2015, 95% of confirmed Lyme Disease cases were in 14 U.S. states.

# Borreliosis – Dogs - 2016



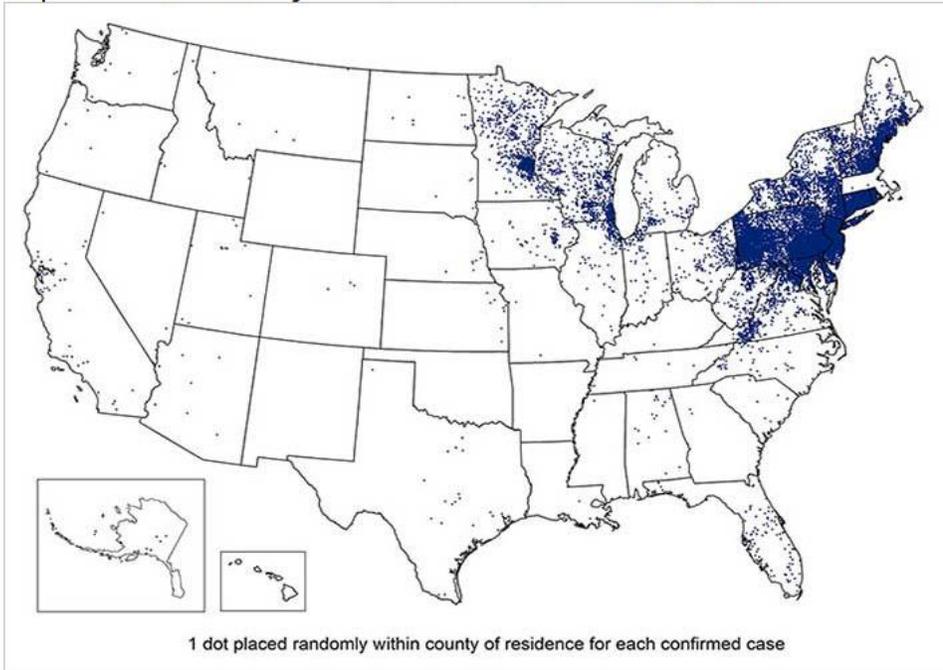
<https://www.pethealthnetwork.com/dog-health/dog-diseases-conditions-a-z/dogs-ticks-and-tick-borne-parasites>

# Borreliosis – Humans - 2018

## Lyme Disease Maps: Historical Data

2018 2017 2016 2015 2014 2013 2012

### Reported Cases of Lyme Disease – United States, 2018

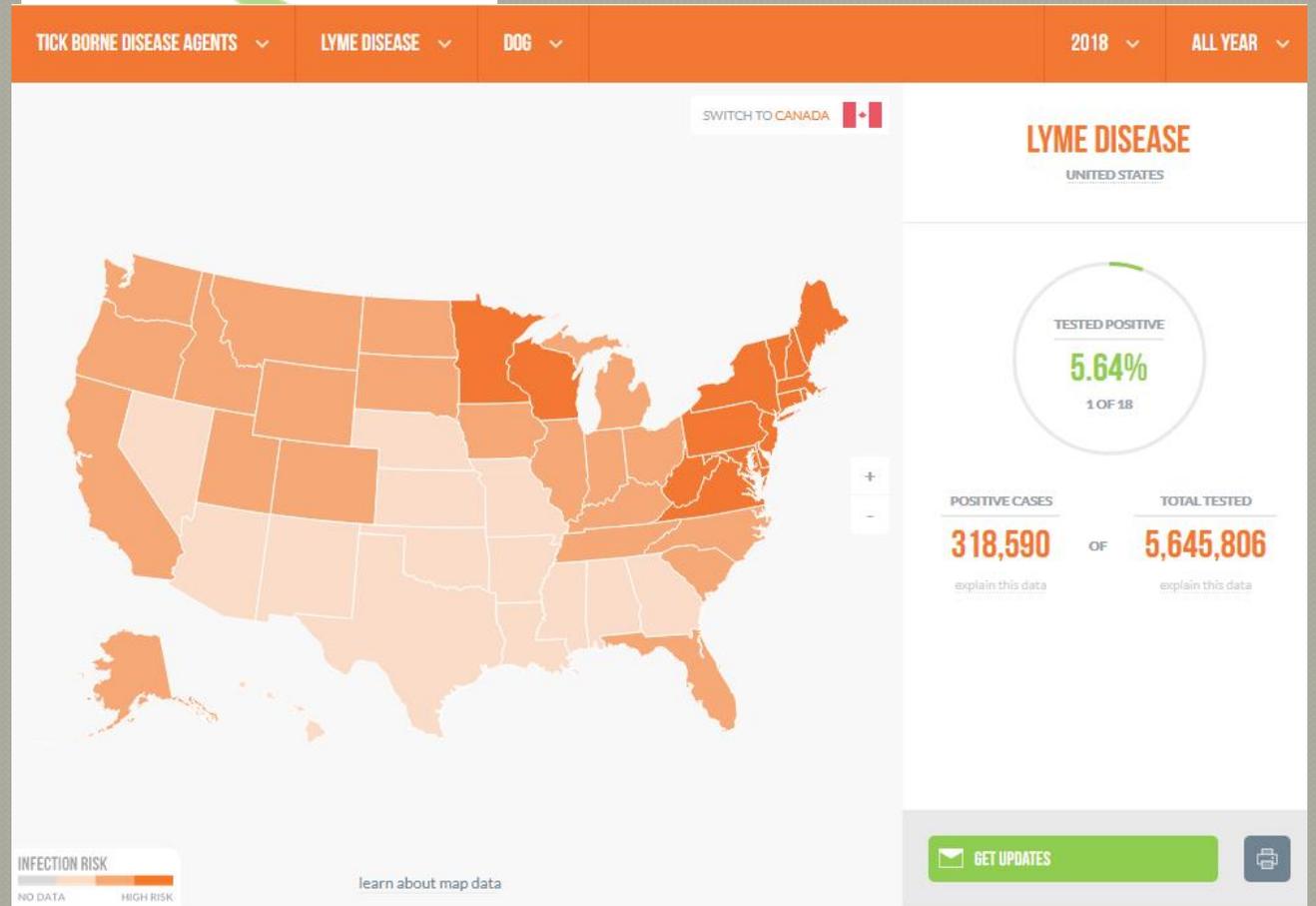


**CDC** Centers for Disease Control and Prevention  
CDC 24/7: Saving Lives, Protecting People™

<https://www.cdc.gov/lyme/stats/maps.html>



# Borreliosis – Dogs - 2018



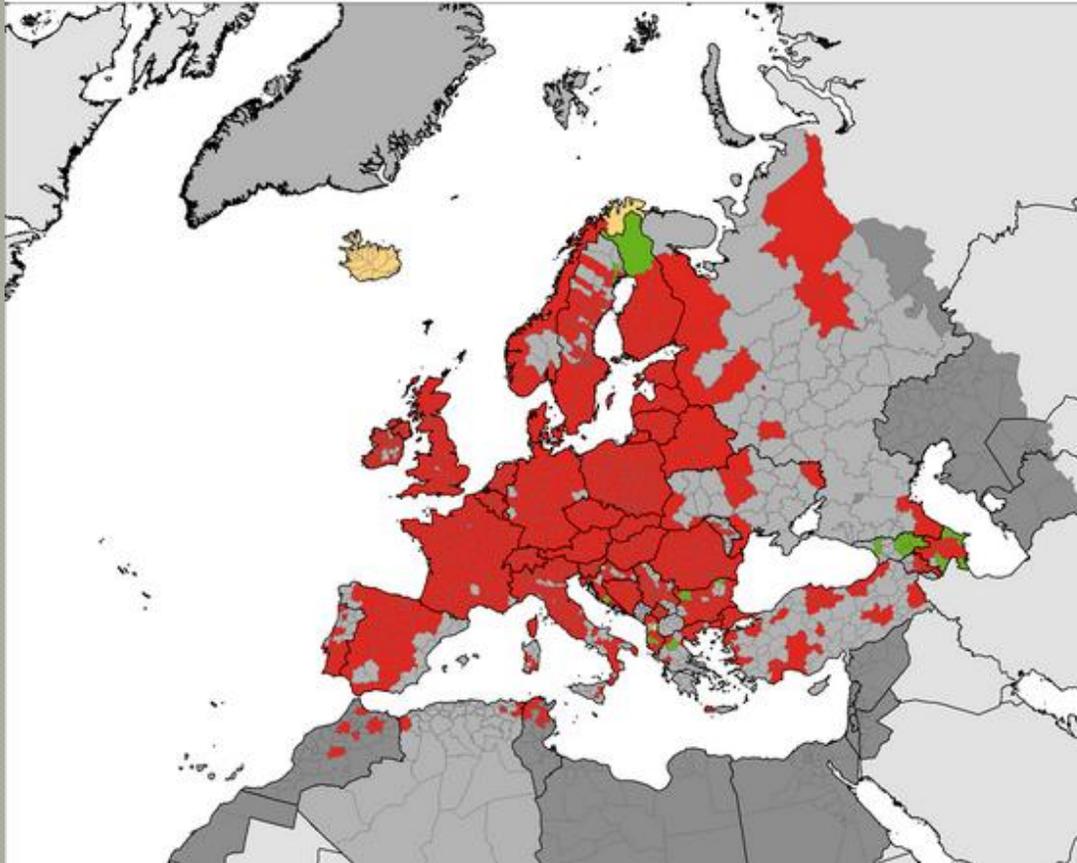
<https://capcvet.org/maps/#2020/all/lyme-disease/dog/united-states/>



# European Centre for Disease Prevention and Control

An agency of the European Union

*Ixodes ricinus*, May 2020



<https://www.ecdc.europa.eu/en/publications-data/ixodes-ricinus-current-known-distribution-may-2020>

## Incidence of Lyme disease in companion animals



<https://cvbd.bayer.com/cvbd-maps>

# New lyme disease forecast map targets rising tide of ticks

Date: May 11, 2017

Source: University of Georgia

Summary: New research offers veterinarians a forecasting map that tells them which parts of the country are most at risk of Lyme disease infections in dogs, which could also help track and predict Lyme disease in people.

University of Georgia. "New lyme disease forecast map targets rising tide of ticks." ScienceDaily. ScienceDaily, 11 May 2017. [www.sciencedaily.com/releases/2017/05/170511120207.htm](http://www.sciencedaily.com/releases/2017/05/170511120207.htm)

## Lyme Policy Wonk



Lorraine Johnson, JD, MBA

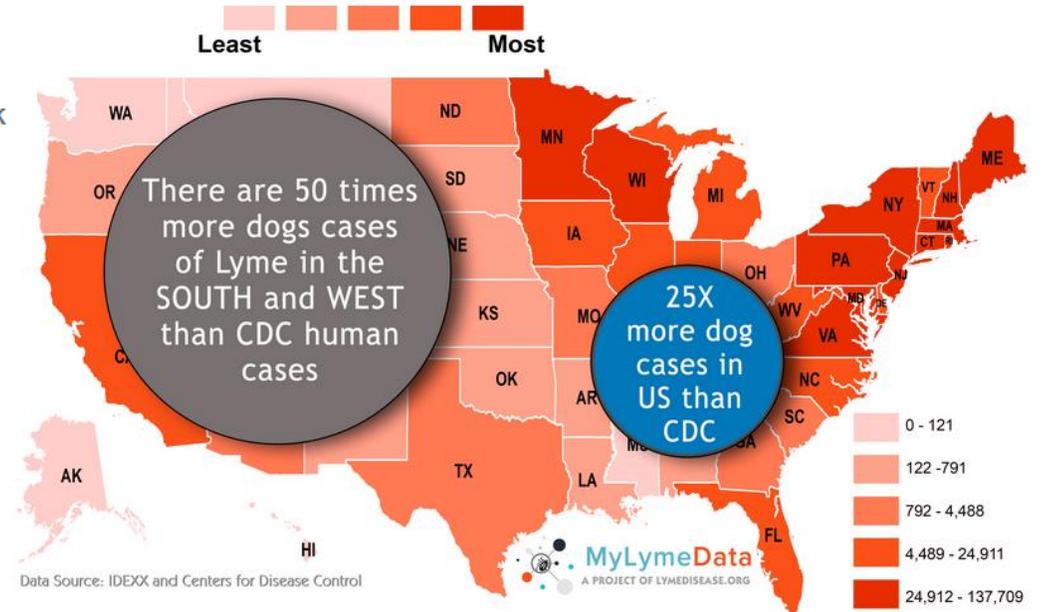


### 24 AUG 2017 LYMEPOLICYWONK: Canine maps predict Lyme disease risk better than the CDC does.



Dogs are considered a good gauge of the exposure of their human owners to infected ticks because they usually share the same environment and visit the same outdoor areas. In other words, canines are considered to be sentinel indicators of Lyme disease risk for humans. Not all dogs who test positive for Lyme antibodies are ill. However, they have been exposed to the Lyme disease bacteria.

## Canine Lyme Cases



<https://www.lymedisease.org/lymepolicywonnk-canine-maps-cdc/>

“Dogs really are the canary in the coal mine for human[Lyme] infection. Our research team has growing evidence that the relationship between risk of canine infection and human disease is strong.”

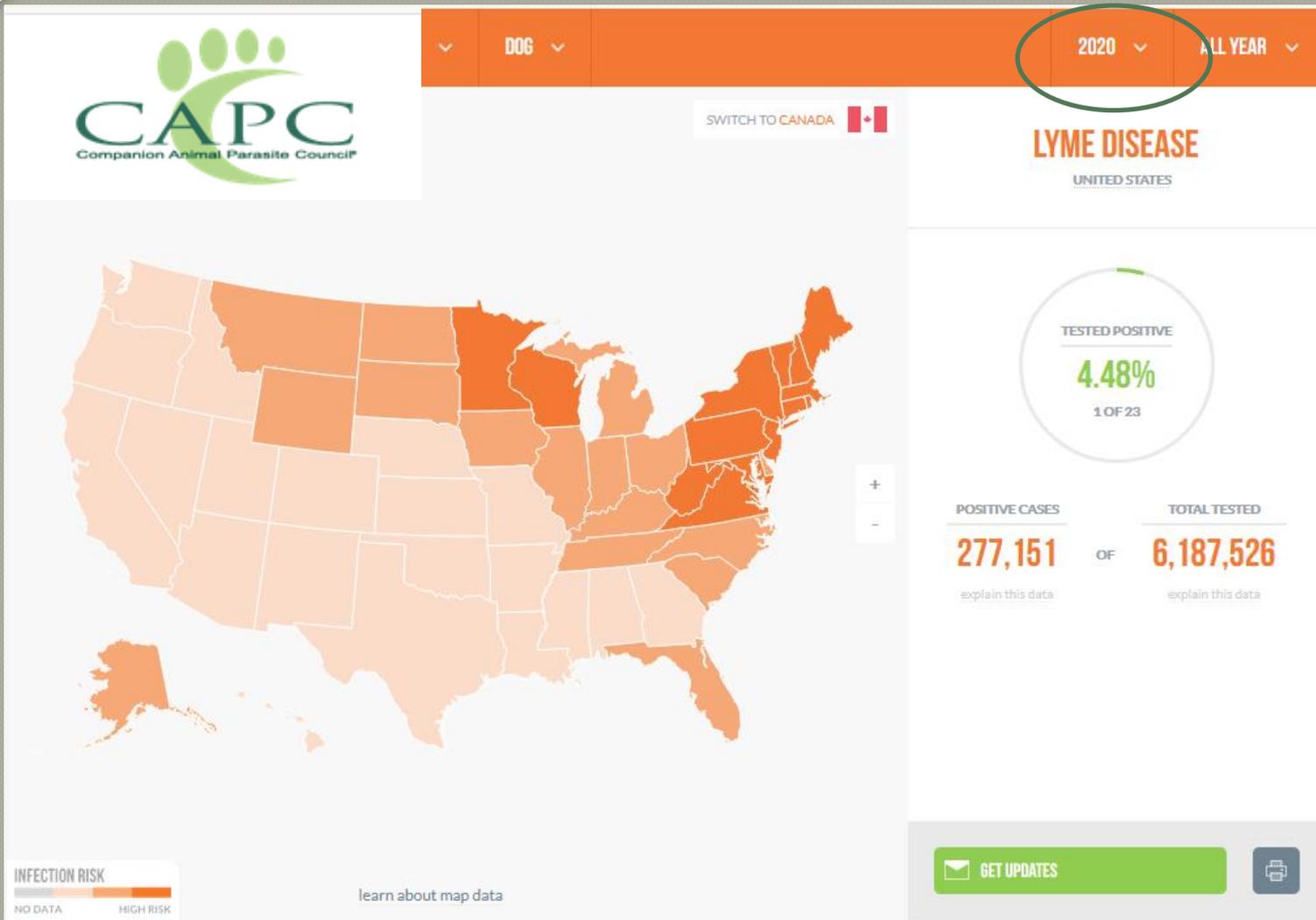
Michael Yabsley, parasitologist, University of Georgia,

John Cockerill 02/29/2020 (6:34 pm)

Reply

It would appear from the complexity of treating Lyme Infected patients, that prevention education would help to stem the epidemic affecting some 700,000 victims, each year in the United States. How is it that the education is so lacking. The corona virus is receiving huge attention from the President Of the United States, but little news bulletins on the upcoming tick attack season.

<https://danielcameronmd.com/when-do-ticks-quest-next-meal/>



Are we paying attention?  
???

Or will we let the humans  
be the Sentinels???

[Comp Immunol Microbiol Infect Dis. 2012 Mar;35\(2\):163-7. doi: 10.1016/j.cimid.2011.12.009. Epub 2012 Jan 16.](#)

## **Estimating Lyme disease risk using pet dogs as sentinels.**

[Smith FD<sup>1</sup>](#), [Ballantyne R](#), [Morgan ER](#), [Wall R](#).

# Comparative Medicine / Translational Research

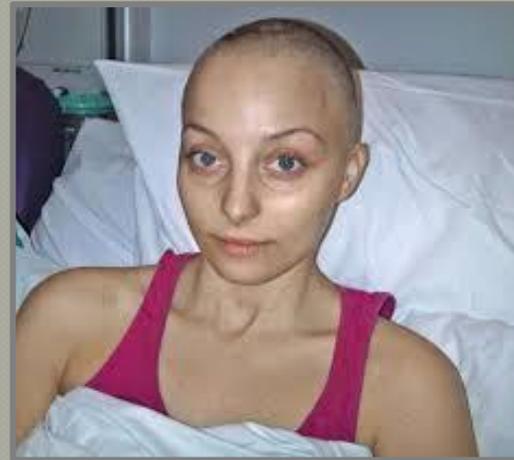
## Meet Ohlin

The University of Pennsylvania's School of Veterinary Medicine is investigating using canine olfaction, along with chemical and nanotechnology analysis, to detect early stage ovarian cancer.

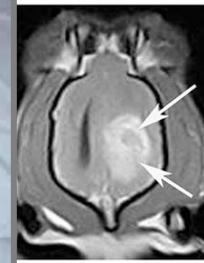
OCSA supports this ground-breaking research by sponsoring Ohlin.



Sniffing out ovarian cancer



glioblastoma multiforme  
in humans



glioblastoma multiforme  
in dogs



## PUCCINI FOUNDATION

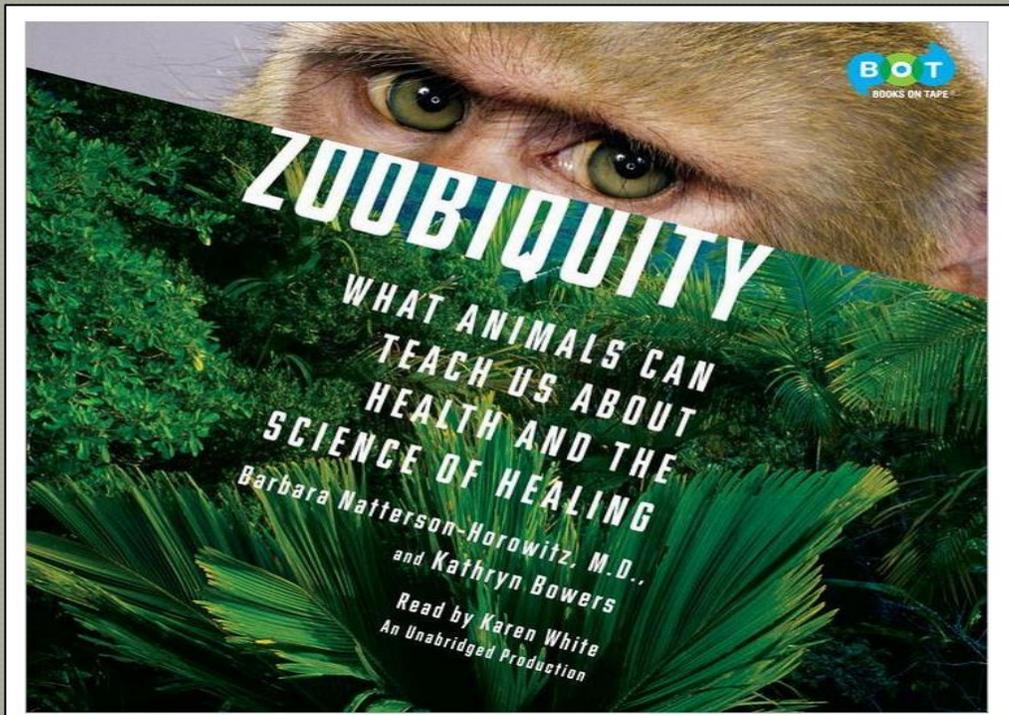
DEDICATED TO THE HOPE OF A FUTURE FOR PETS AND PEOPLE...  
CANCER FREE



## THE BOO RADLEY FOUNDATION

*Healing Man and Man's Best Friend*

# ZOOBIQUITY CONFERENCE 6 Philadelphia



2015

**Zoobiquity: A Species-Spanning Approach to Medicine**

# What 'ARE' the Challenges ???

## Our Systems.....

- Academic Tenure process
- Government Agency silos
- Industry Proprietary knowledge
- Publication systems – no access  
(See ' Open Science can Save the Planet  
<https://goo.gl/8yIVQp> )
- Language barriers across professions (unfamiliar acronyms)



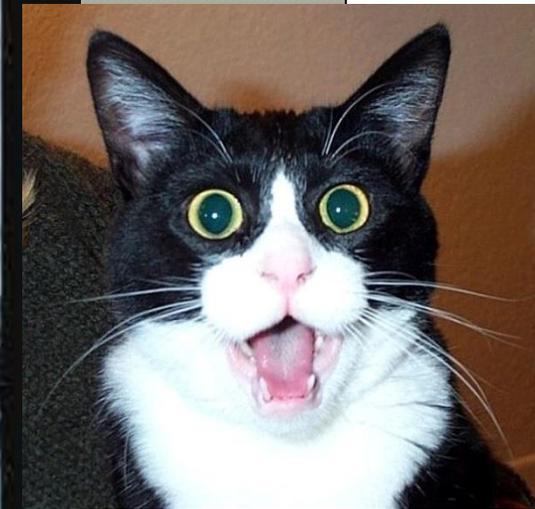
Our 'Systems'  
have pushed us  
into

'Silos'





**What can we DO!!!!**



**IMPROVING THE HEALTH OF PEOPLE,  
ANIMALS, PLANTS AND OUR ENVIRONMENT**



**See 'What' we are doing to:**

"CONNECT" - One Health Stakeholders to

"CREATE" - Strategic Networks/Teams /Partnerships that will

"EDUCATE" - About One Health and One Health issues.

[What is One Health video](#)

[OH Public Service Announcement](#)

[OHC Letter to The White House](#)

[One Health Action Teams](#)

[One Health - 'A Ray of Hope'](#)

**Support The Commission**



**Students for One Health**



**One Health in the News**



**One Health Hot Topics**



HARI **Satu** Kesehatan  
 DÜNYA **Tek** Sağlık GÜNÜ  
 DIA MUNDIAL DA **Saúde** Unica  
 GIORNATA MONDIAL **salute** unica

DÍA DE **Una** Salud  
 one health DAY  
 JOURNÉE **Une** santé  
 DÜNYA **Tek** Sağlık GÜNÜ

ZIUA INTERNATIONALA **one health**

created and hosted by   



ANNUAL **one health** DAY **november 3**

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

created and hosted by   

check [www.onehealthday.org](http://www.onehealthday.org) for more information





## CDC's One Health Office – Key Focus Areas

*Achieving Optimal Health Outcomes for People and Animals*



## Highlights: One Health Activities in the United States

- **Provide** technical assistance, expertise, and policy input on One Health projects, emergencies, and issues
- **Coordinating** federal One Health Zoonotic Disease Prioritization activities in collaboration with DOI and USDA
- **Address** IHR core capacities from US Joint External Evaluation and US National Action Plan for Health Security
- **Lead** One Health Federal Interagency Network (**OH-FIN**)
- **Partner** with US government partners, industry, professional organizations, and others on zoonoses prevention



<https://www.cdc.gov/onehealth/index.html>

## One Health



**One Health** recognizes that the health of people is connected to the health of animals and the environment. It is a collaborative, multisectoral, and transdisciplinary approach—working at the local, regional, national, and global levels—with the goal of achieving optimal health outcomes recognizing the interconnection between people, animals, plants, and their shared environment.

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

[Learn more about One Health.](#)



Learn How We Can Work Together for One Health

## One Health Zoonotic Disease Prioritization

**Most commonly prioritized zoonoses:**

1. Rabies
2. Zoonotic Influenza viruses
3. Viral Hemorrhagic Fevers
4. Brucellosis
5. Anthrax

## Upcoming ZOHU Calls

## Overview:

<http://bit.ly/2L77AcO>

## Healthy Pets, Healthy People

[www.cdc.gov/healthypets](http://www.cdc.gov/healthypets)



2009

# One Health Tripartite Note

**OIE WORLD ORGANISATION FOR ANIMAL HEALTH**  
Protecting animals, preserving our future

Font size: \* AA  
Keywords

Home About us Scientific expertise Solidarity Animal health in the World

Home > For the media

- For the media
  - OIE PHOTO COMPETITION
  - Infographics
  - Press releases
  - Editorials
  - Press packs
  - Animal diseases
  - Key documents
  - Multimedia

Agriculture and Consumer Protection Department  
**Animal Production and Health**

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS  
for a world without hunger

العربية 中文 español français русский

HOME THEMES PROGRAMMES/PROJECTS PARTNERS RESOURCES

HOME  
AGA News  
News Archive

**ONE HEALTH**  
**FAO in One Health: working proactively instead of reactively**  
The current approaches to animal disease prevention and control emphasize transmission disruption. Whilst critically important, this approach in itself does not address the root causes of disease

also in AGA website...  
FAO as One Health: Moving Forward  
FAO in development of major initiative to combat infectious diseases

World Health Organization

Health topics Data Media centre Publications Countries Programmes

Cost effectiveness and strategic planning

WHO-CHOICE

OneHealth Tool

Global price tags

GeoAccess

Economic burden of disease

Documents

**FAO/OIE/WHO Collaboration (Tripartite)**

International partnership to address human-animal-environment health risks gets a boost

Standing from left to right: Dr. Tedros Adhanom Ghebreyesus, Director-General of WHO, Dr. Monique Eloit, Director General of the OIE and Mr. Jose Graziano da Silva, FAO Director General after signature of the MOU

FAO / Yannick Coumarin  
30 May 2018 – The Food and Agriculture Organization of the United Nations (FAO), the World Health Organization (WHO) and the World Organisation for Animal Health (OIE) today agreed to step up joint action to combat health

[http://www.who.int/influenza/resources/documents/tripartite\\_concept\\_note\\_hanoi\\_042011\\_en.pdf](http://www.who.int/influenza/resources/documents/tripartite_concept_note_hanoi_042011_en.pdf)



## Who's who in the mentorship program?

### Mentees

Over 230 students from 34 countries

- Undergraduate
  - Zoology
  - Engineering
  - Environmental Health
  - Nutrition
  - Biomedical Laboratory Training
- Masters
  - Public Health
  - Pharmacy
  - Microbiology
  - Epidemiology
  - Economics
- Nursing
- Veterinary
- Medical
- PhD



### Mentors

- Veterinarians
- Doctors
- Microbiologists
- Epidemiologists
- Virologists
- Wildlife biologists
- Economists
- Dentists
- Toxicologists
- Food Safety Officers
- Anthropologists
- Nurses
- Ecologists
- Public Health Officials
- Business Administrators
- Environmental Biologists
- Parasitologists
- Engineers
- Social Scientists

Over 150 professionals from 41 countries

## ISOHA Mentorship Program

SPRING 2019

FIRST ANNUAL



<https://tinyurl.com/y4fedahc>

# Nov One Health Month 2017



**State of Iowa Executive Department**  
IN THE NAME AND BY THE AUTHORITY OF THE STATE OF IOWA

**PROCLAMATION**

**WHEREAS,** the Iowa One Health Conference was October 14, 2017; and

**WHEREAS,** One Health is defined as the collaborative effort of multiple health and social science professions, together with their related disciplines and institutions – working locally, nationally and globally – to attain optimal health for people, domestic animals, wildlife and our environment; and

**WHEREAS,** One Health as an approach to solving problems has gained the support of bodies including the World Health Organization, the United States Department of Agriculture, the United States Centers for Disease Control and Prevention and the United States Food and Drug Administration; and

**WHEREAS,** a One Health approach can lead to improved disease surveillance and prevention, fully collaborative health education and research and more rapid development of effective therapies and health-related products; and

**WHEREAS,** Iowa is a national leader in developing solutions to many interconnected problems that impact the health of humans, animals and the environment that include environmental effects on crop yields, diseases transmissible between humans and domestic animals, economic factors impacting the availability of healthcare and water quality issues; and

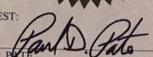
**WHEREAS,** solving these problems requires the concerted efforts of many professionals and trainees working and studying in fields such as human and veterinary medicine, environmental sciences, statistics, economics, agronomy, social sciences and engineering.

**NOW, THEREFORE,** I, Kim Reynolds, Governor of the State of Iowa, proclaim November 2017, as

**IOWA ONE HEALTH MONTH**

IN TESTIMONY WHEREOF, I HAVE HERE-UNTO SUBSCRIBED MY NAME AND CAUSED THE GREAT SEAL OF THE STATE OF IOWA TO BE AFFIXED. DONE AT DES MOINES THIS 22nd DAY OF NOVEMBER IN THE YEAR OF OUR LORD 2017.

**ATTEST:**  
PAUL PATTE  
SECRETARY OF STATE





**The State of Washington**

**Proclamation**

**WHEREAS,** the state of Washington seeks to protect and improve the health of all Washingtonians, which is inextricably linked to the health of Washington's domestic animals, wildlife, and environment, by promoting and strengthening One Health efforts in our state; and

**WHEREAS,** the state of Washington is a leader in developing solutions to the complex health issues that face us today, including antimicrobial resistance, infectious disease spread, and air and water quality challenges; and

**WHEREAS,** addressing these and future problems requires the combined efforts of many agencies, organizations, and professionals across sectors; and

**WHEREAS,** One Health is a collaborative, multi-sector, transdisciplinary approach that fosters strong partnerships among and between Washington's agencies, clinicians, professionals, industries, and academic institutions; and

**WHEREAS,** information about the One Health approach can foster communication, collaboration, and coordination among professionals in the human, animal, and environmental health fields and improve awareness for the general public about the necessity of an interdisciplinary approach in solving health challenges; and

**WHEREAS,** the Washington State Department of Health, the Washington State Department of Agriculture, the Washington State Department of Fish and Wildlife, and other state agencies, academic institutions, physicians, veterinarians, and local public health organizations, are collaborating to promote the One Health approach;

**NOW, THEREFORE,** I, Jay Inslee, Governor of the state of Washington, do hereby proclaim November 3, 2019, as

**One Health Day**

In Washington, and I encourage all people in our state to join me in this special observance.

Signed this 30<sup>th</sup> day of October, 2019

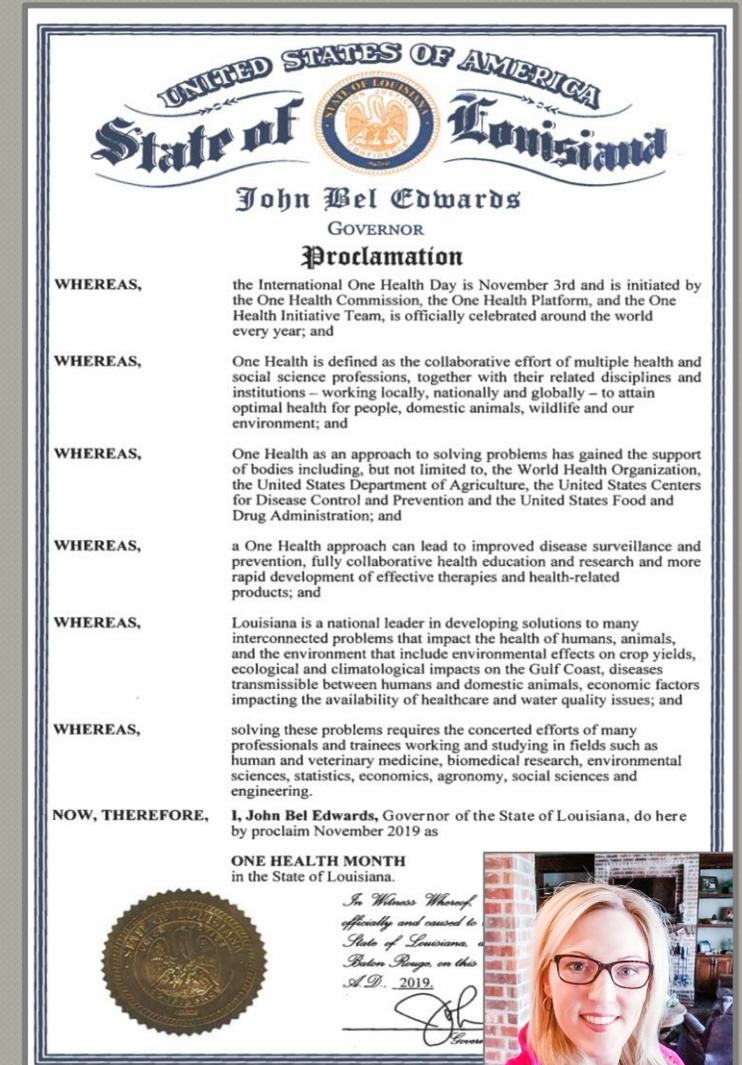
**Gov. Jay Inslee**

# One Health Day Nov 3, 2019



ISOHA has created an instructional document on how to pursue legislative or executive branch advocacy for One Health initiatives. While focused on government advocacy in the United States, this document may also be helpful for those planning One Health advocacy in any country. <http://bit.ly/2B3aLek>

# Nov One Health Month 2019



**UNITED STATES OF AMERICA**  
**State of Louisiana**

**John Bel Edwards**  
GOVERNOR

**Proclamation**

**WHEREAS,** the International One Health Day is November 3rd and is initiated by the One Health Commission, the One Health Platform, and the One Health Initiative Team, is officially celebrated around the world every year; and

**WHEREAS,** One Health is defined as the collaborative effort of multiple health and social science professions, together with their related disciplines and institutions – working locally, nationally and globally – to attain optimal health for people, domestic animals, wildlife and our environment; and

**WHEREAS,** One Health as an approach to solving problems has gained the support of bodies including, but not limited to, the World Health Organization, the United States Department of Agriculture, the United States Centers for Disease Control and Prevention and the United States Food and Drug Administration; and

**WHEREAS,** a One Health approach can lead to improved disease surveillance and prevention, fully collaborative health education and research and more rapid development of effective therapies and health-related products; and

**WHEREAS,** Louisiana is a national leader in developing solutions to many interconnected problems that impact the health of humans, animals, and the environment that include environmental effects on crop yields, ecological and climatological impacts on the Gulf Coast, diseases transmissible between humans and domestic animals, economic factors impacting the availability of healthcare and water quality issues; and

**WHEREAS,** solving these problems requires the concerted efforts of many professionals and trainees working and studying in fields such as human and veterinary medicine, biomedical research, environmental sciences, statistics, economics, agronomy, social sciences and engineering.

**NOW, THEREFORE,** I, John Bel Edwards, Governor of the State of Louisiana, do hereby proclaim November 2019 as

**ONE HEALTH MONTH**  
in the State of Louisiana.

*In Witness Whereof*  
officially and caused to be  
State of Louisiana.  
John Bel Edwards, on this  
A.D. 2019.

**John Bel Edwards**



116TH CONGRESS  
1ST SESSION

# S. 1903

To establish an interagency One Health Program, and for other purposes.

IN THE SENATE

Ms. SMITH (for herself  
was read twice an  
Labor, and Pension

116TH CONGRESS  
1ST SESSION

# H. R. 3771

To establish an interagency One Health Program, and for other purposes.

IN THE HOUSE OF REPRESENTATIVES

JULY 16, 2019

Mr. SCHRADER (for himself and Mr. YOHO) introduced the following bill, which was referred to the Committee on Energy and Commerce, in addition to the Committees on Agriculture, Natural Resources, and Foreign Affairs, for a period to be subsequently determined by the Speaker in each case for consideration of such provisions as fall within the jurisdiction of the committee concerned:

To establish an i

1 *Be it enacted*

2 *tives of the Uni*

3 **SECTION 1. SHC**

4 This Act i

5 Preparedness T

6 **SEC. 2. FINDING**

## A BILL

To establish an interagency One Health Program, and for other purposes.

1 *Be it enacted by the Senate and House of Representa-*  
2 *tives of the United States of America in Congress assembled,*

3 **SECTION 1. SHORT TITLE.**

4 This Act may be cited as the "Advancing Emergency  
5 Preparedness Through One Health Act of 2019".

6 **SEC. 2. FINDINGS.**



Senator Tina Smith



Senator Todd Young



Representative  
Kurt Schrader



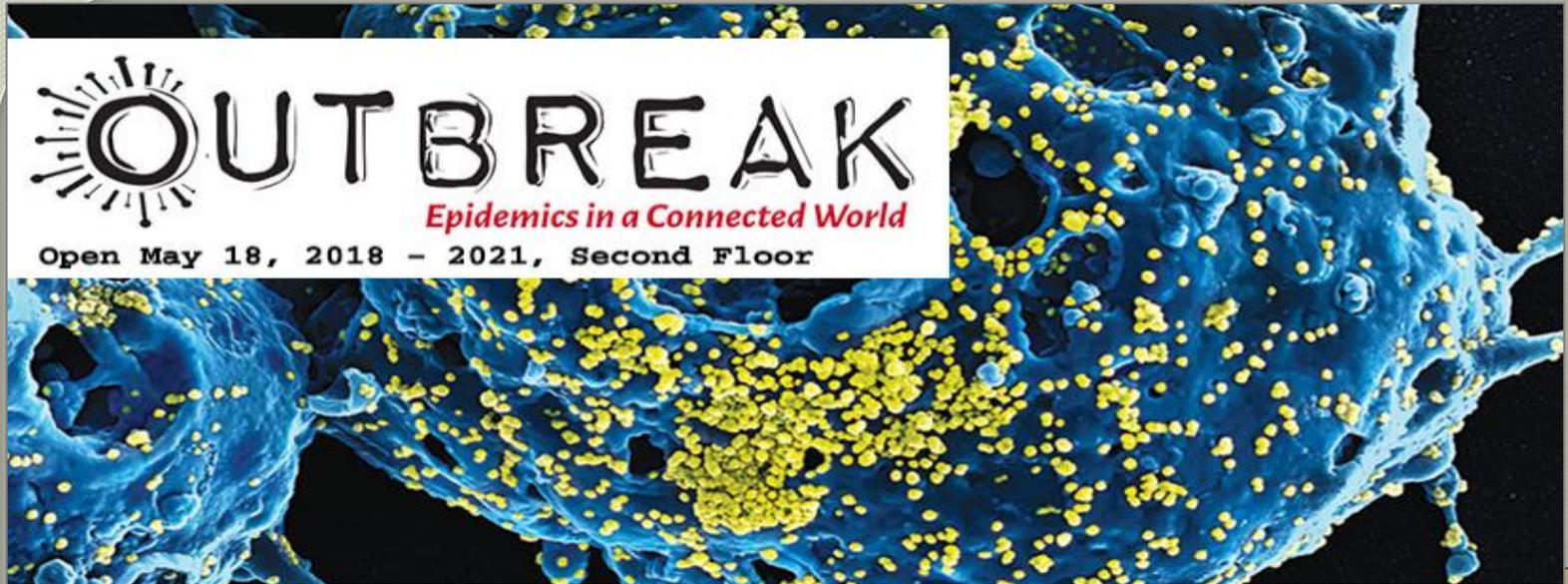
Representative  
Ted Yoho



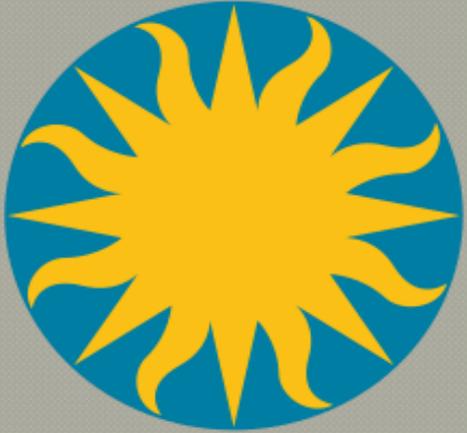
To establish in the US  
an Inter-Agency One Health Program

July 16, 2019

June 19, 2019



2018



Smithsonian





# Ray of Hope for the Future

<http://bit.ly/2HICemX>

# ***Collaborations***

start with

# ***Relationships!!***

*Which start when we  
come together in direct conversations*





# Dream the Future

## “It’s Up to US”!!

Supporters and advocates, to make One Health the default way of doing business around the world!!



Cheryl Stroud, DVM, PhD  
Executive Director

***One Health is  
A ‘Ray of Hope’  
for the Future***



**ONE HEALTH COMMISSION**

