

New and re-emerging infectious diseases

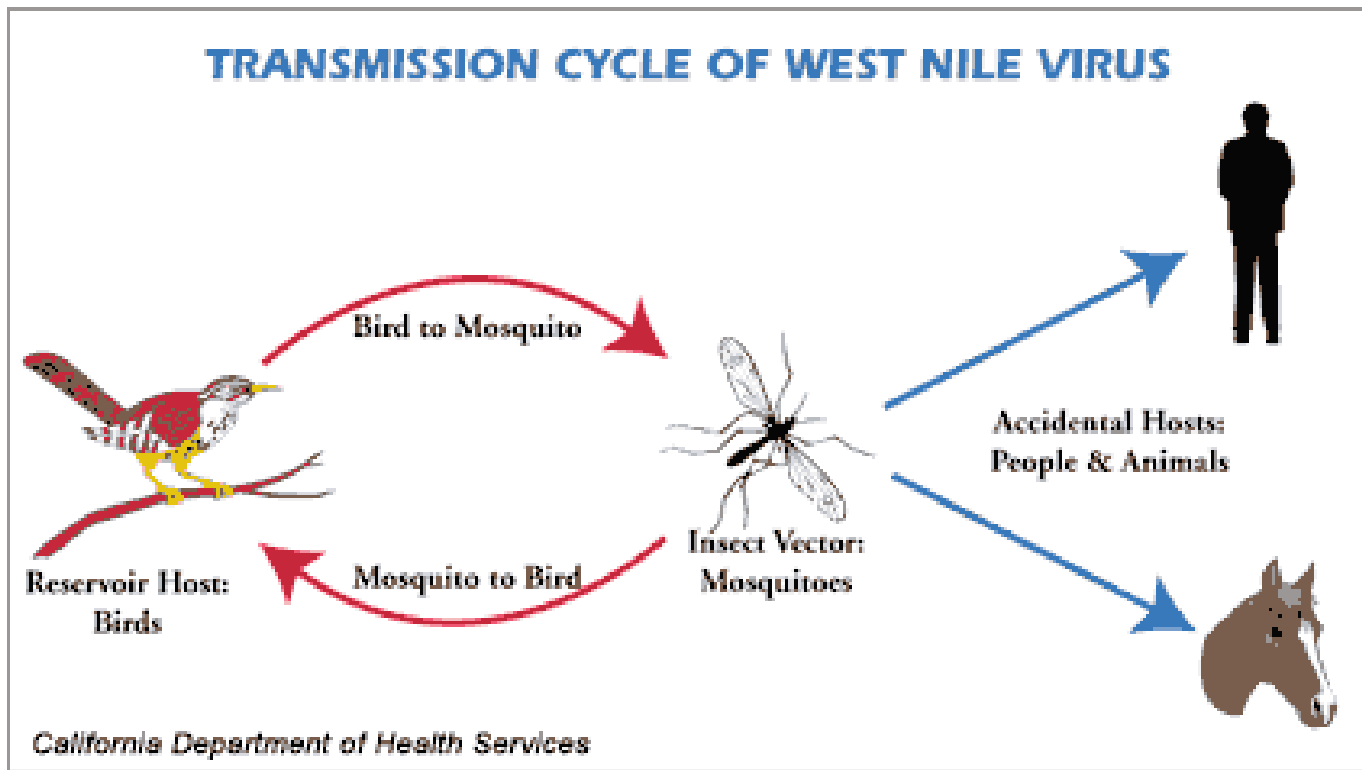
Bernhard Fleischer

German Society for Tropical Medicine and International Health
Bernhard Nocht Institute for Tropical Medicine, Hamburg, Germany



Example 1

West Nile virus infection: a mosquito-borne zoonosis



West-Nile virus cases in the USA

1999






Incidence per million


-  .01-9.99
-  10-99.99
-  ≥ 100
-  Any WNV Activity

2000

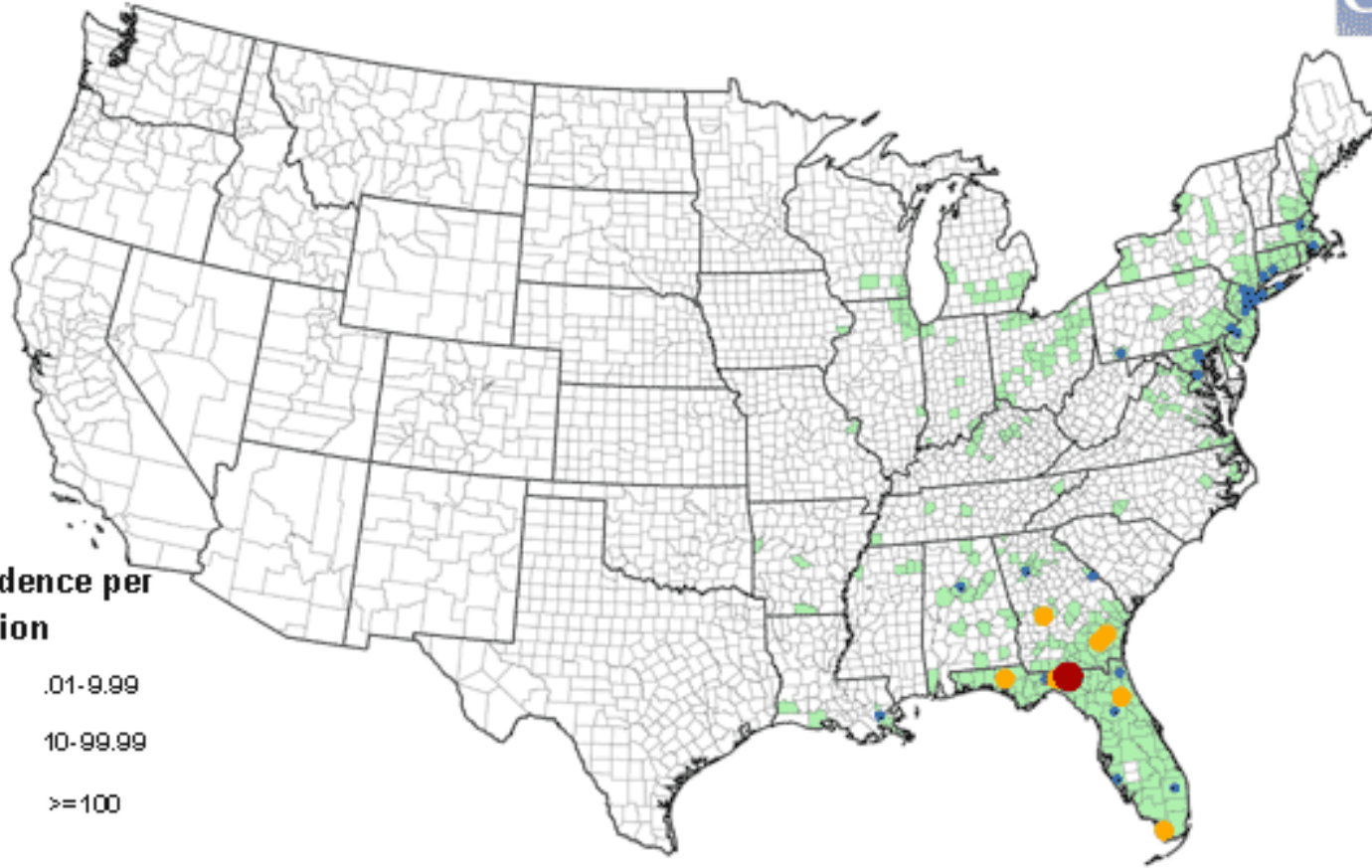


Incidence per million

-  .01-9.99
-  10-99.99
-  ≥ 100

 Any WNV Activity

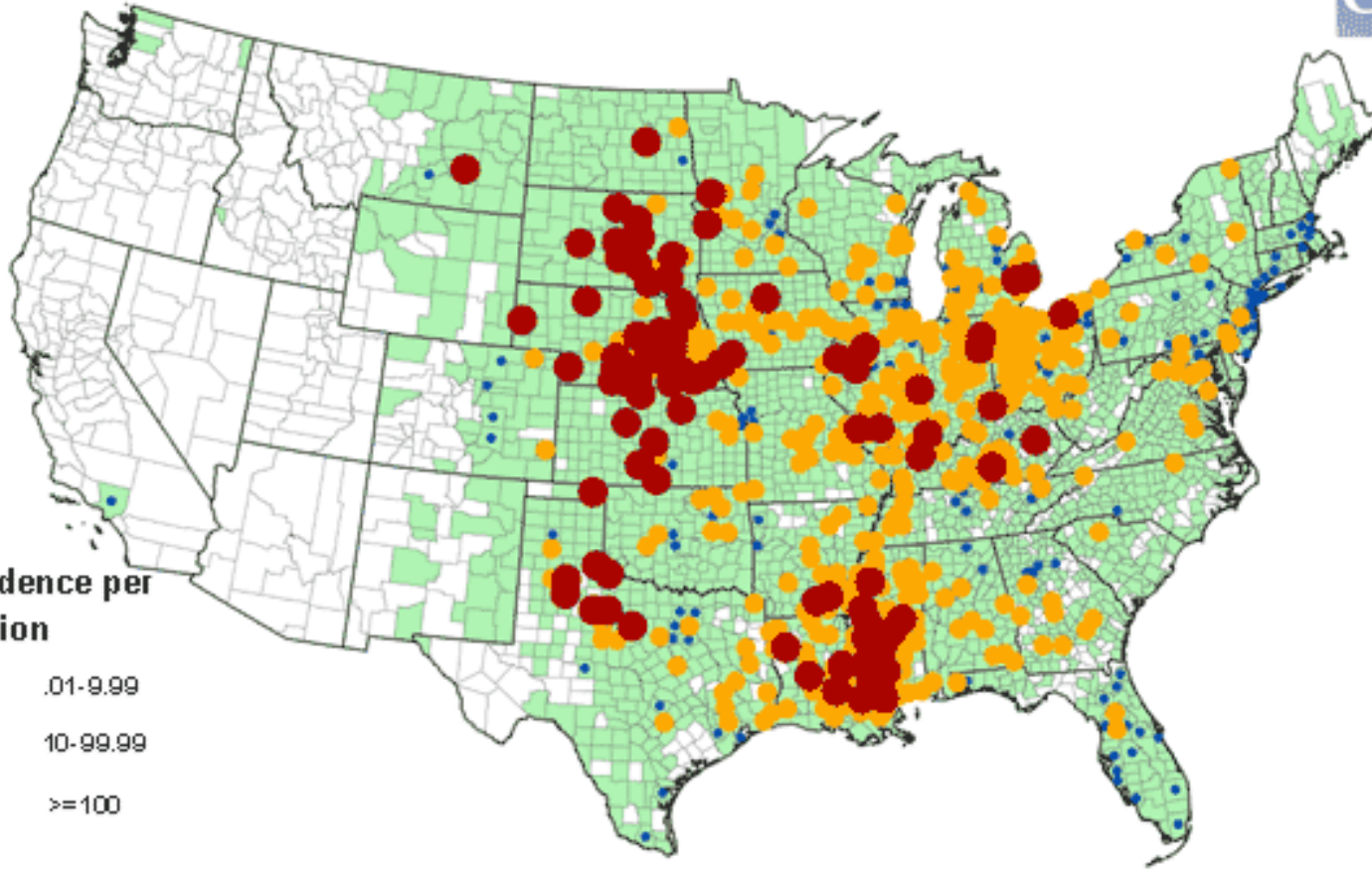
2001






Incidence per million


-  .01-9.99
-  10-99.99
-  ≥ 100
-  Any WNV Activity

2002

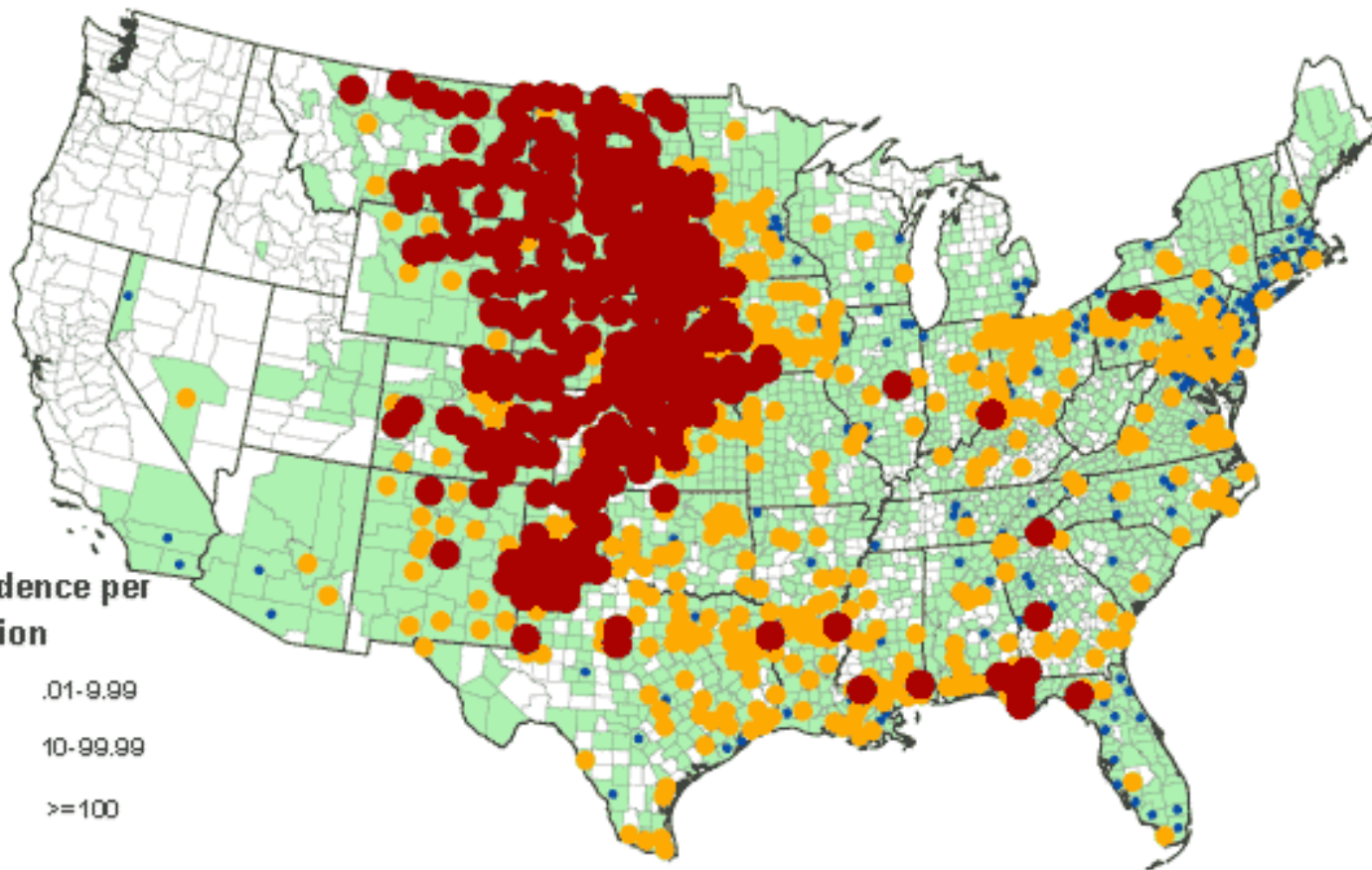


Incidence per million




-  .01-9.99
-  10-99.99
-  ≥ 100

 Any WNV Activity

2003

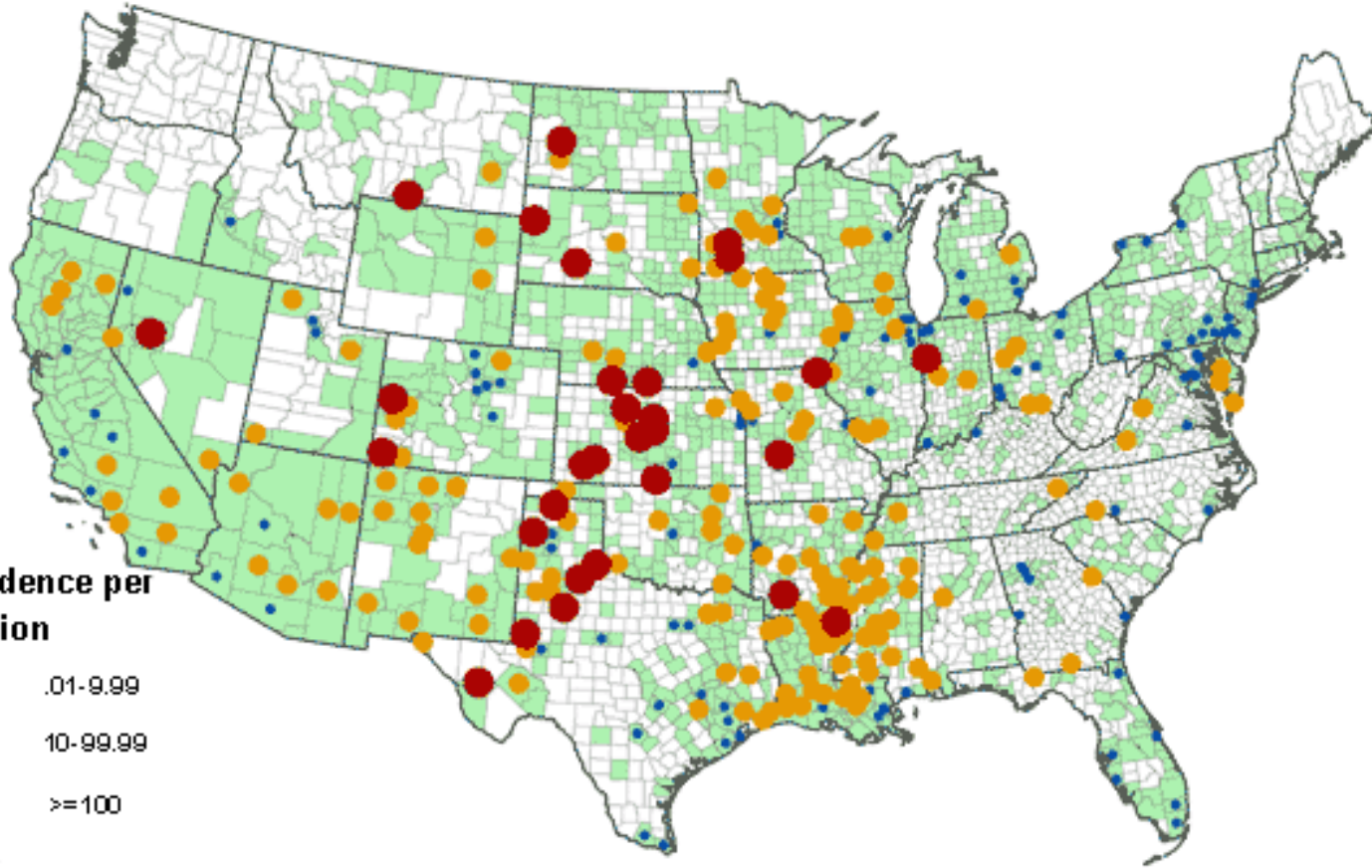


Incidence per million

-  .01-9.99
-  10-99.99
-  ≥ 100


 Any WNV Activity

2004

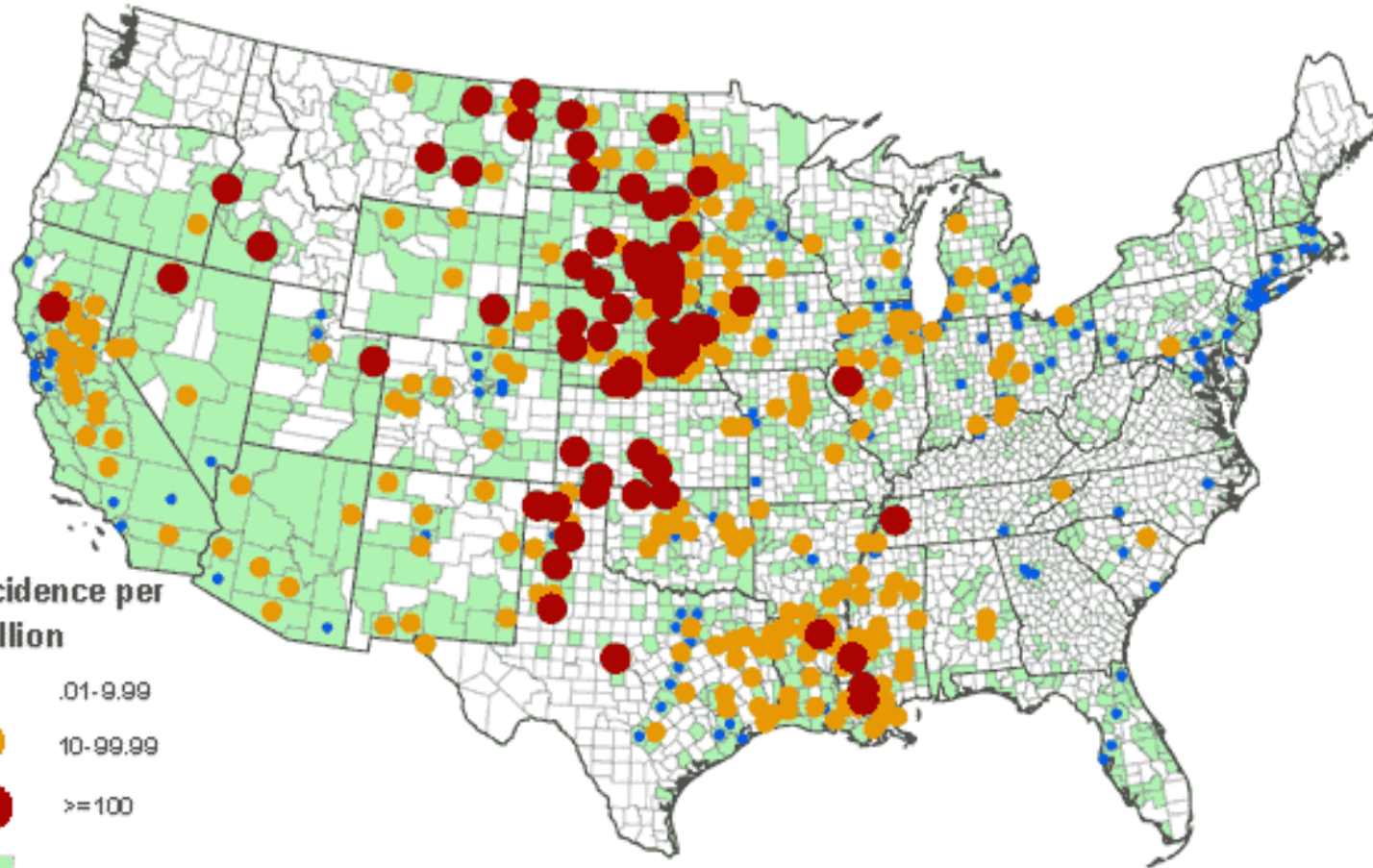


Incidence per million




-  .01-9.99
-  10-99.99
-  ≥ 100


 Any WNV Activity

2005

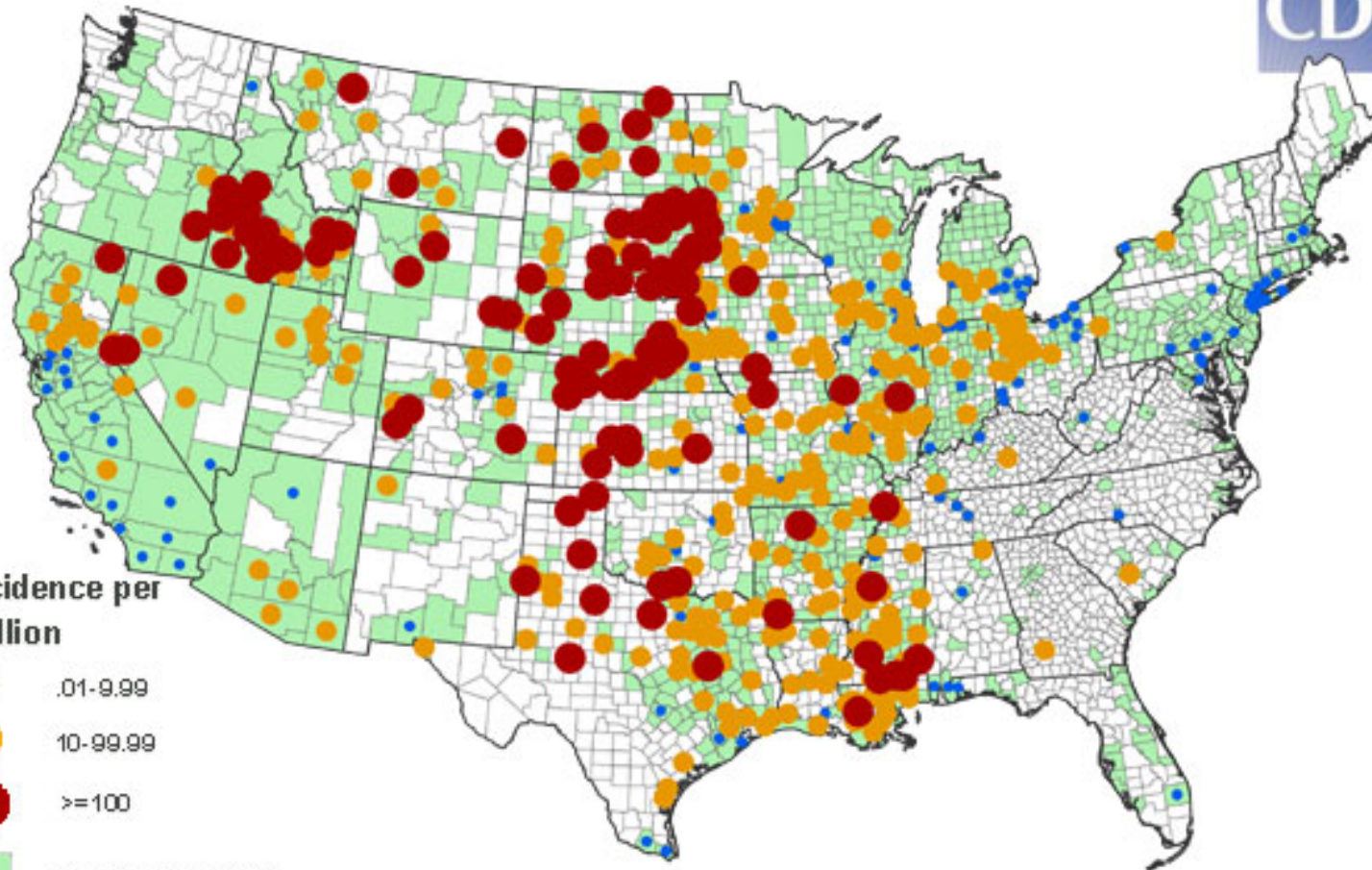


Incidence per million

-  .01-9.99
-  10-99.99
-  ≥ 100

 Any WNV Activity

2006



Incidence per million

- .01-9.99
- 10-99.99
- ≥ 100
- Any WNV Activity

After the West Nile virus epidemic

- transition into endemicity
- public attention waned
- vaccine project discontinued

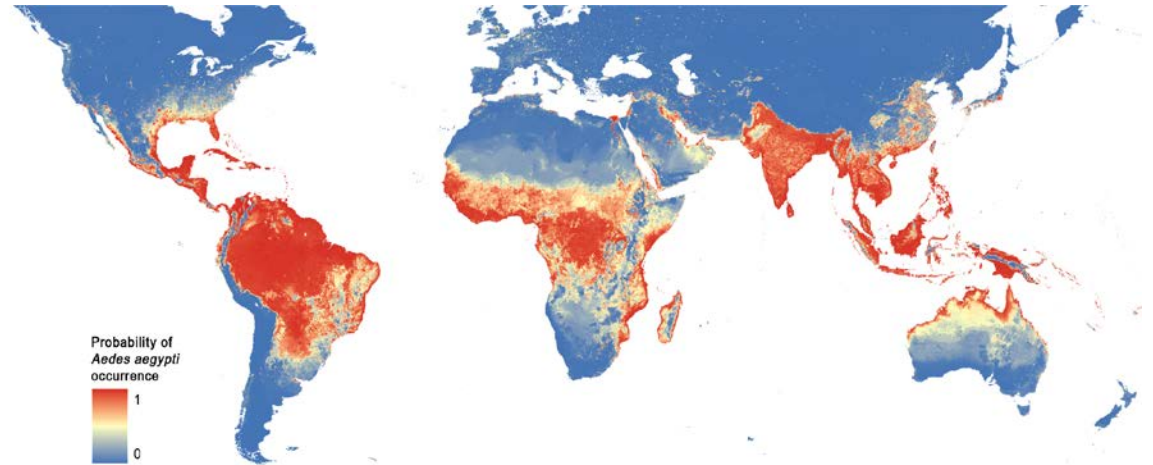
Research needed on

- epidemiology
- long-term morbidity
- vector competencies
- immunity

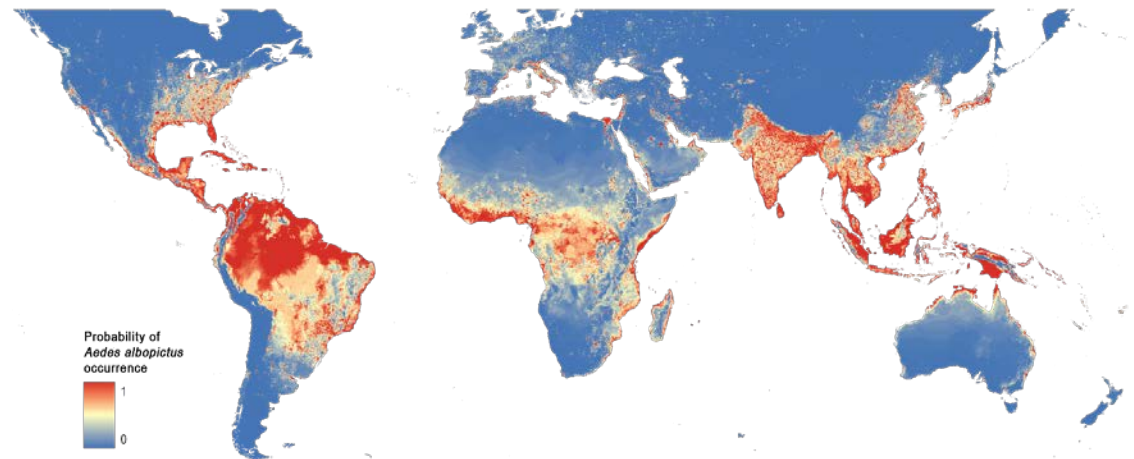
Globalisation of *Aedes* mosquitos

Vectors for Yellow Fever, Chikungunya,
Dengue, Japanese Encephalitis, Zika

Aedes aegypti



Aedes albopictus



Greatest concern for pre-pandemic viruses:

Respiratory transmission

Basic Reproduction Number (R_0):

1 infected person infects

Ebola	1-2
SARS	2-5
HIV	4-7
Smallpox	5-7
Pertussis	12-17
Measles	12-18

Example 2

Middle East Respiratory Syndrome (MERS)

The NEW ENGLAND JOURNAL of MEDICINE

2012

BRIEF REPORT

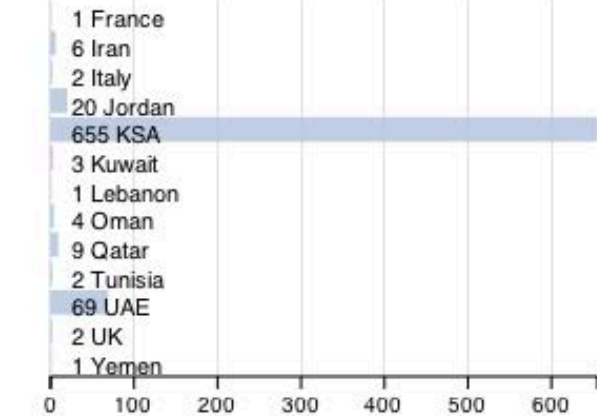
Isolation of a Novel Coronavirus from a Man with Pneumonia in Saudi Arabia

Ali Moh Zaki, M.D., Ph.D., Sander van Boheemen, M.Sc., Theo M. Bestebroer, B.Sc.,
Albert D.M.E. Osterhaus, D.V.M., Ph.D., and Ron A.M. Fouchier, Ph.D.

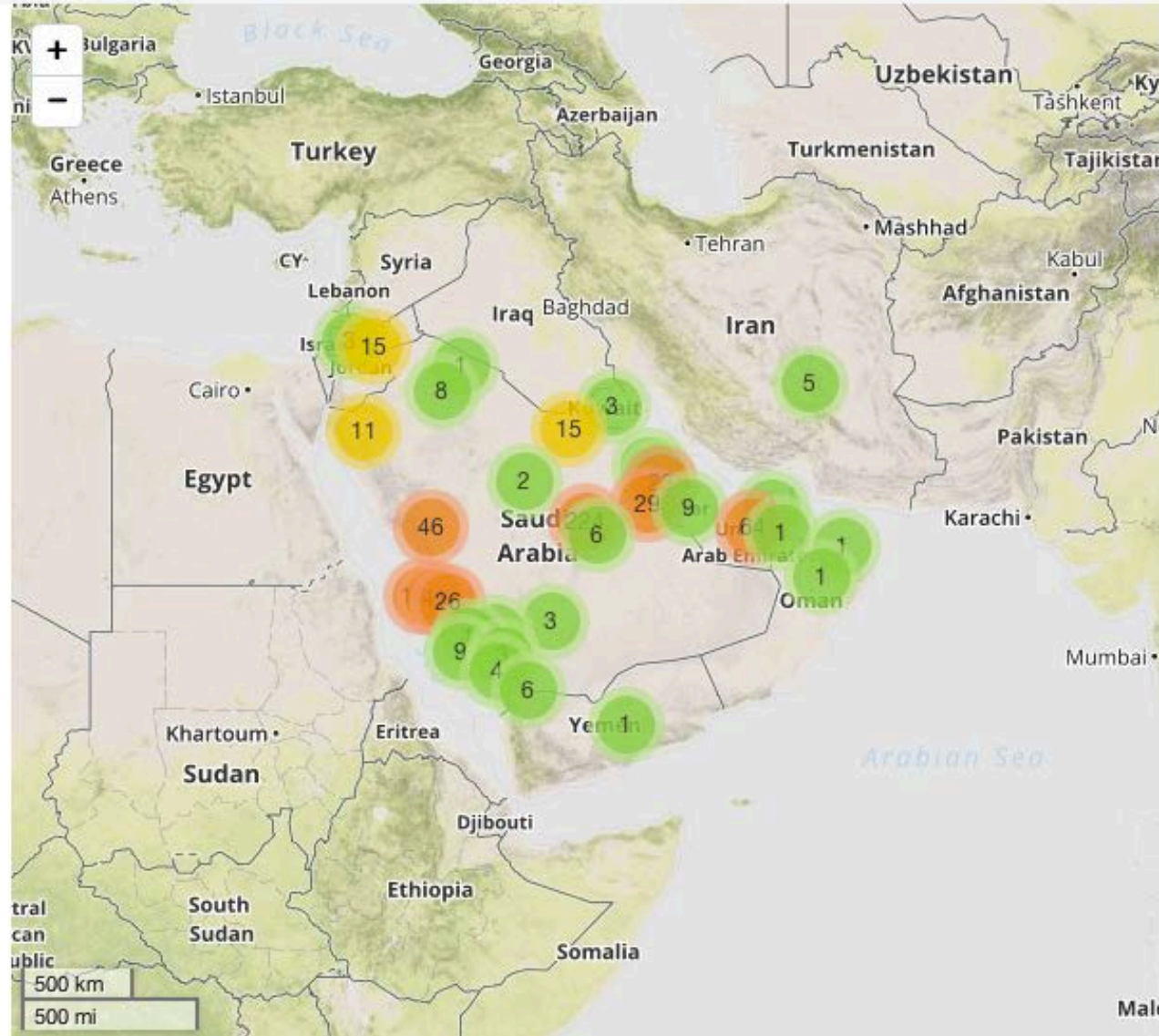
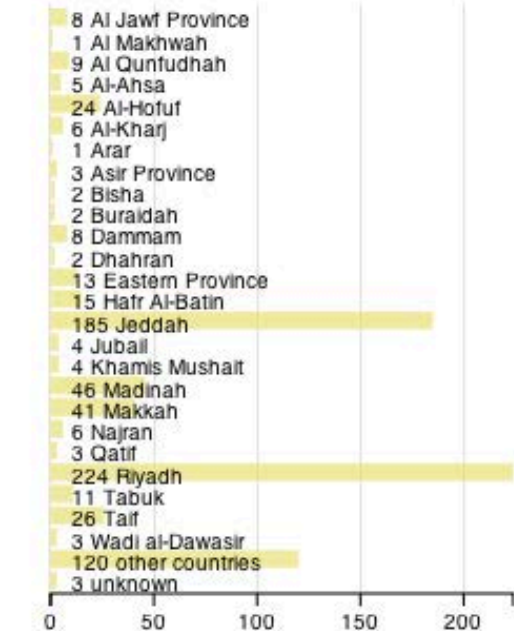
MERS, 2012. Middle East Respiratory Syndrome

Spatial Distribution

Cases by country of infection



Cases by KSA location



Origin of Human Coronavirus 229E from bats. Endemic human virus may be a descendant of camelid-associated viruses

Link of a ubiquitous human coronavirus to dromedary camels

PNAS | August 30, 2016

Victor M. Corman^{a,b,1}, Isabella Eckerle^{a,1}, Ziad A. Memish^c, Anne M. Liljander^d, Ronald Dijkman^{e,f}, Hulda Jonsdottir^{e,f}, Kisi J. Z. Juma Ngeiywa^g, Esther Kamau^g, Mario Younan^h, Malakita Al Masriⁱ, Abdullah Assiriⁱ, Ilona Gluecks^j, Bakri E. Musa^k, Benjamin Meyer^a, Marcel A. Müller^a, Mosaad Hilali^l, Set Bornstein^m, Ulrich Werneryⁿ, Volker Thiel^{e,f}, Joerg Jores^{d,o}, Jan Felix Drexler^{a,b,2}, and Christian Drosten^{a,b,2}

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Journal of Virology, December 2015

Evidence for an Ancestral Association of Human Coronavirus 229E with Bats

© Victor Max Corman^{a,b}, Heather J. Baldwin^{c,d}, Adriana Fumie Tateno^{a,e}, Rodrigo Melim Zerbinati^{a,e}, Augustina Annan^f, Michael Owusu^f, Evans Ewald Nkrumah^f, Gael Darren Maganga^g, Samuel Oppong^h, Yaw Adu-Sarkodie^h, Peter Vallo^{c,i}, Luiz Vicente Ribeiro Ferreira da Silva Filho^{a,j}, Eric M. Leroy^{g,k}, Volker Thiel^{l,m}, Lia van der Hoekⁿ, Leo L. M. Poon^o, Marco Tschapka^{c,p}, Christian Drosten^{a,b}, Jan Felix Drexler^{a,b}

Institute of Virology, University of Bonn Medical Centre, Bonn, Germany^a; German Centre for Infection Research, Partner Site Bonn-Cologne, Bonn, Germany^b; Institute of Evolutionary Ecology and Conservation Genomics, University of Ulm, Ulm, Germany^c; Department of Biological Sciences, Macquarie University, Sydney, New South Wales,

Urgent questions / tasks

Research on

- Virus evolution and interspecies transmission
- Pre-human viruses, reservoirs
- Vector competence
- Vaccines
- Antivirals
- Point-of-care molecular diagnostics
- Life stock and wild life surveillance
- Targeted and sustainable vector control measures

We want to stop future epidemics by developing new vaccines for a safer world

Coalition for Epidemic Preparedness Innovations

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