The role of Environmental changes in Infectious Disease Outbreaks and Epidemics

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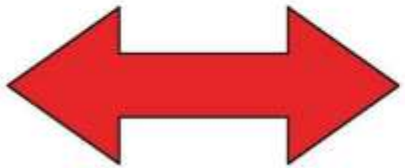
March 20, 2023

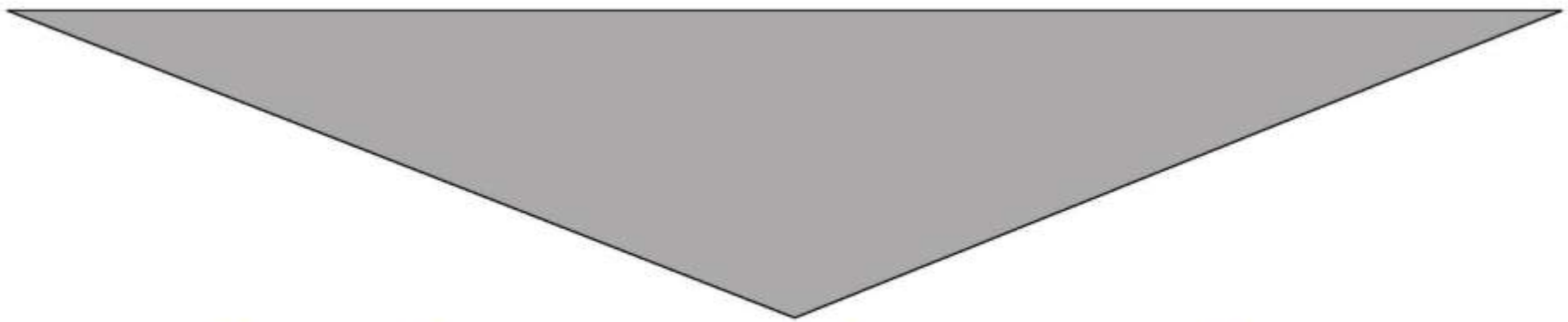
National Institute of Allergy and Infectious Diseases

NIAID Research: A Dual Mandate

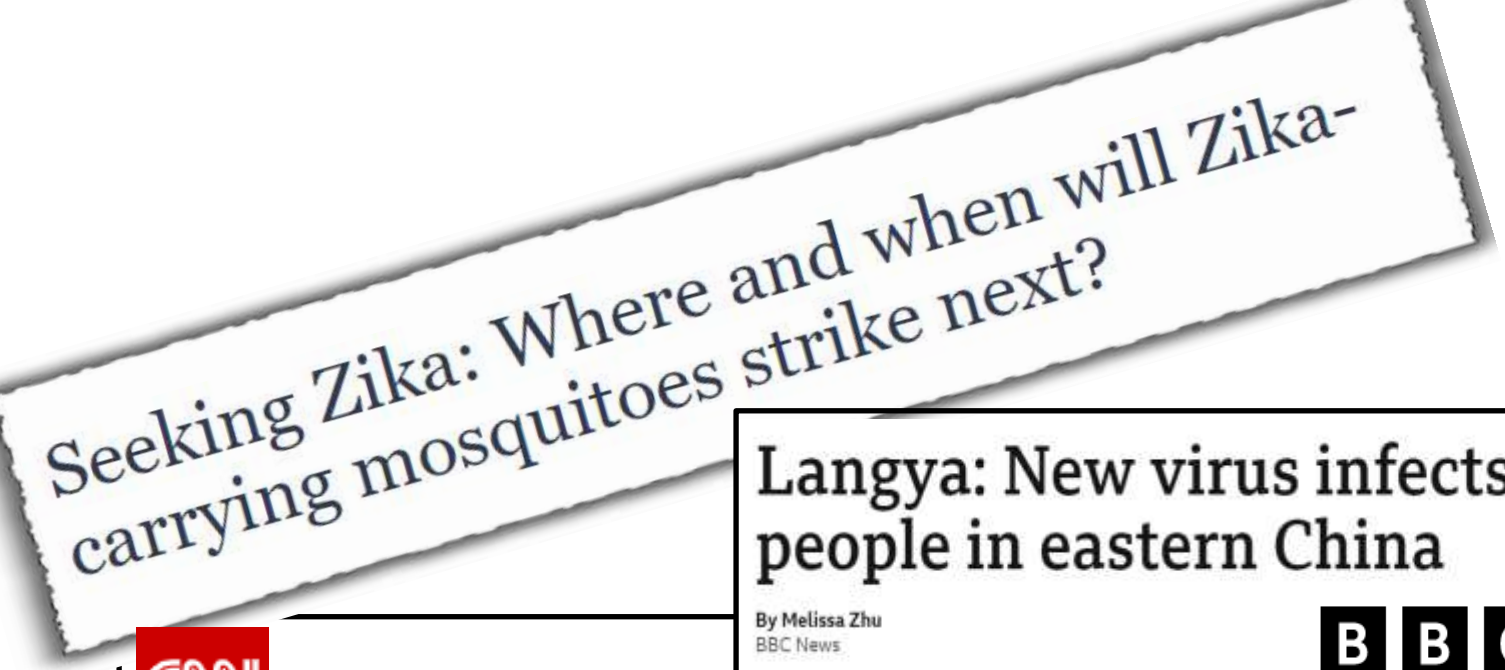
Maintain and "grow" a robust basic and applied research portfolio in microbiology, infectious diseases, immunology and immune-mediated diseases



Respond rapidly to new and emerging disease threats



New/Improved Interventions


Seeking Zika: Where and when will Zika-carrying mosquitoes strike next?


Miami Herald
Chikungunya fever finally makes it to the United States - two cases in South Florida
JULY 17, 2014 AT 7:37 PM

Langya: New virus infects 35 people in eastern China
By Melissa Zhu
BBC News
10 August
BBC


CNN
Global experts race to understand rare cases when monkeypox leads to death
Aug 12, 2022


REUTERS
End of COVID pandemic is 'in sight' -WHO chief
September 14, 2022


FOX13 TAMPA BAY
Florida reports first human case of dengue of 2022, issues mosquito-born illness advisory
By Emilee Speck and Brandy Campbell | Published July 21, 2022 | Florida | FOX Weather

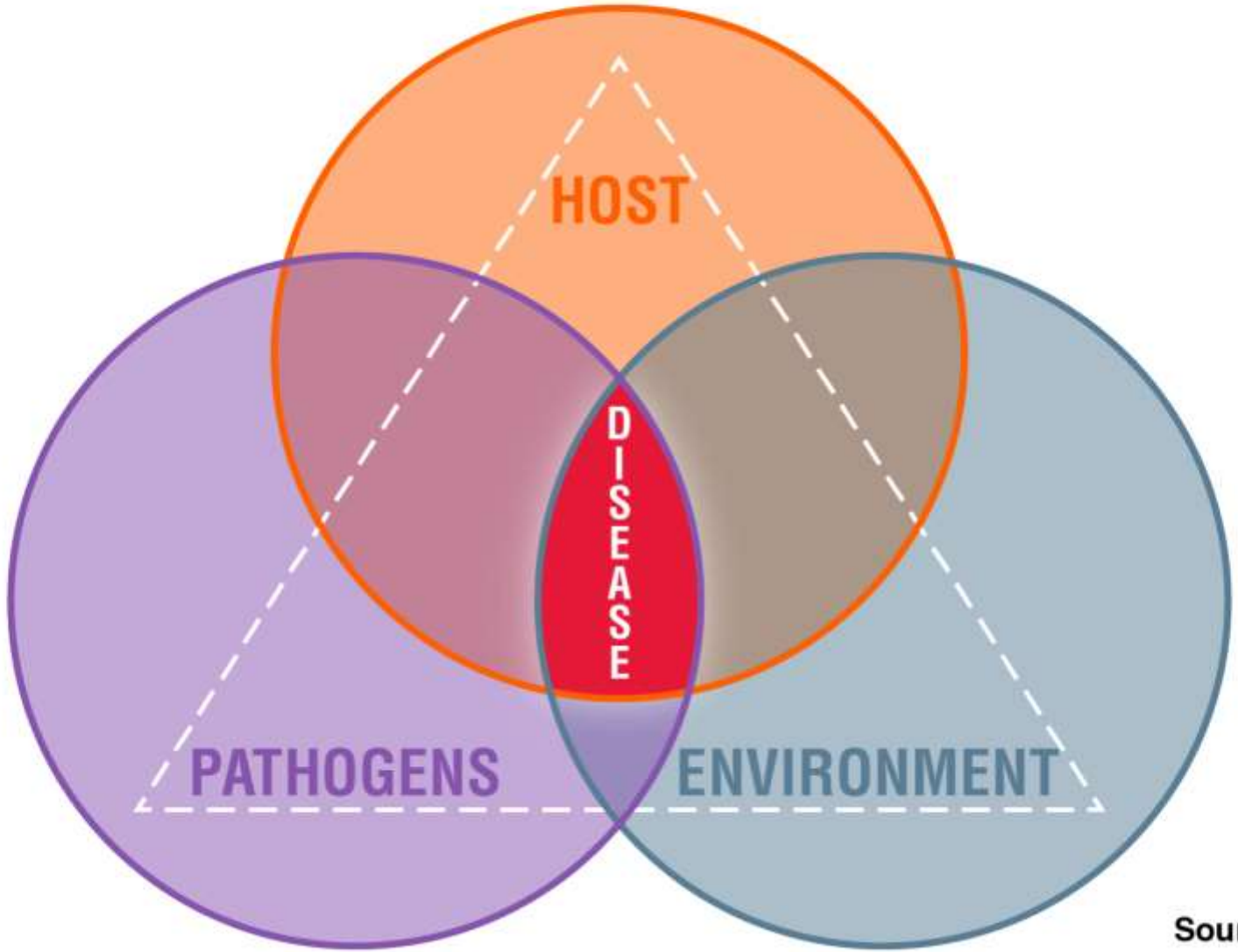
~75 Percent of Emerging Pathogens are Zoonotic

Examples:

- HIV
- Influenza
- Human monkeypox
- Nipah virus
- BSE/vCJD
- SARS
- Ebola

Source: Taylor et al., 2001; WHO

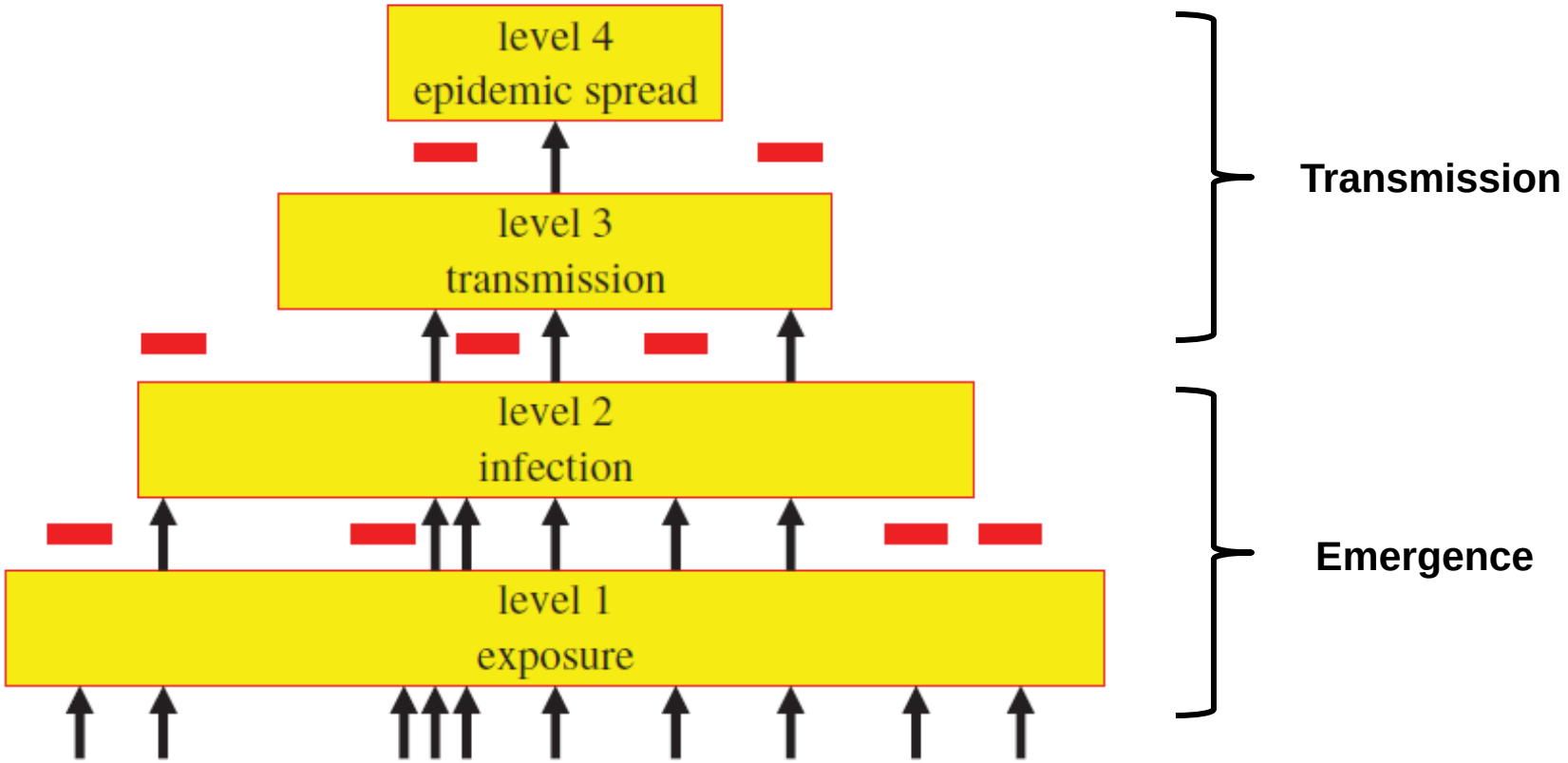
Determinants of Disease Emergence: Pathogens, Hosts, and the Environment



Source: Morens and Fauci, 2020

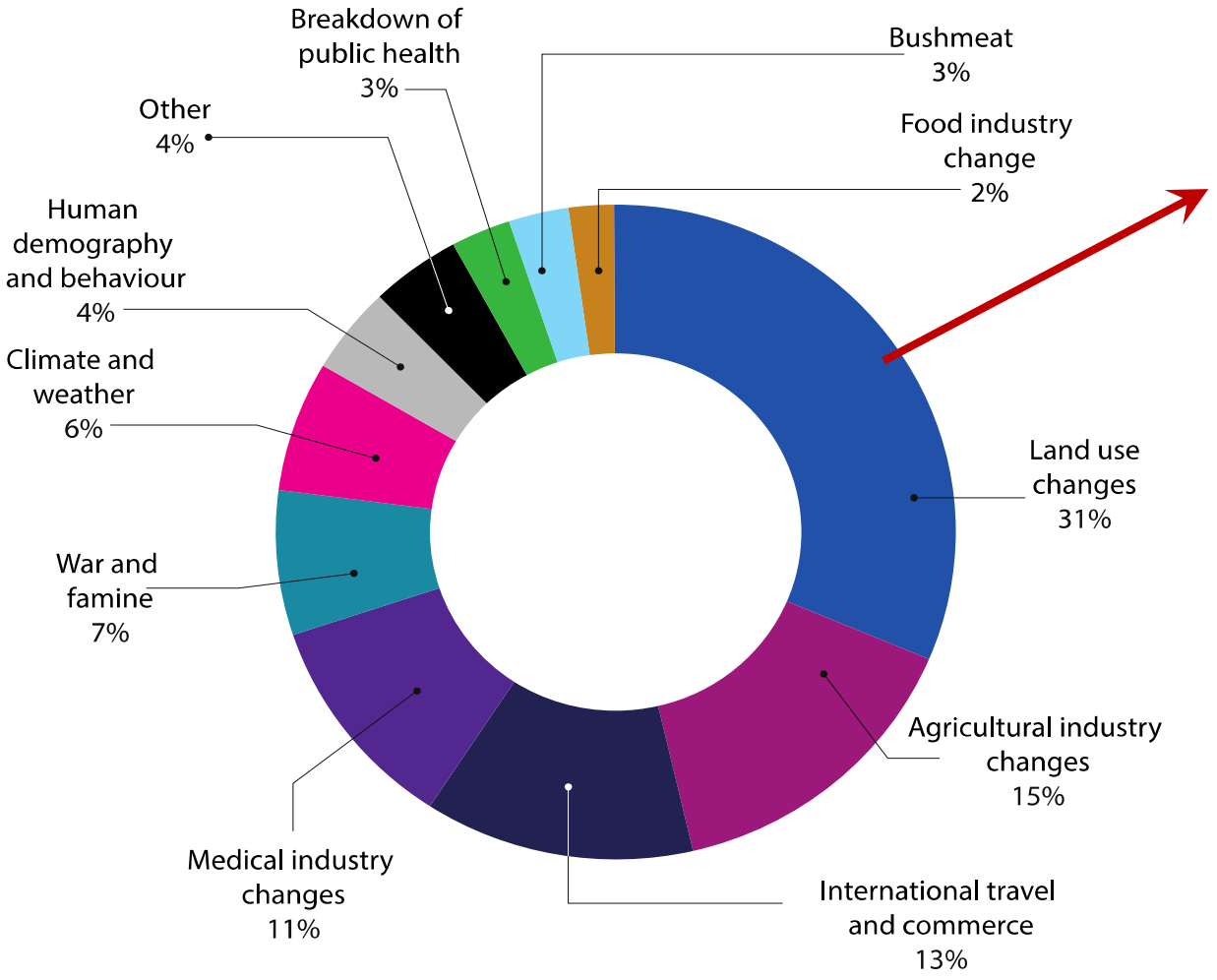
AS Fauci/NIAID

Interaction between pathogens and humans



Phil. Trans. R. Soc. B (2012) 367, 2864–2871
doi:10.1098/rstb.2011.0354

Global Environmental Change Drives Disease Emergence



Deforestation
Agricultural intensification
Habitat degradation
Habitat fragmentation

Institute of Medicine. Smolinski *et al.* 2003
Loh *et al.* Vector Borne & Zoonotic Dis. 2015

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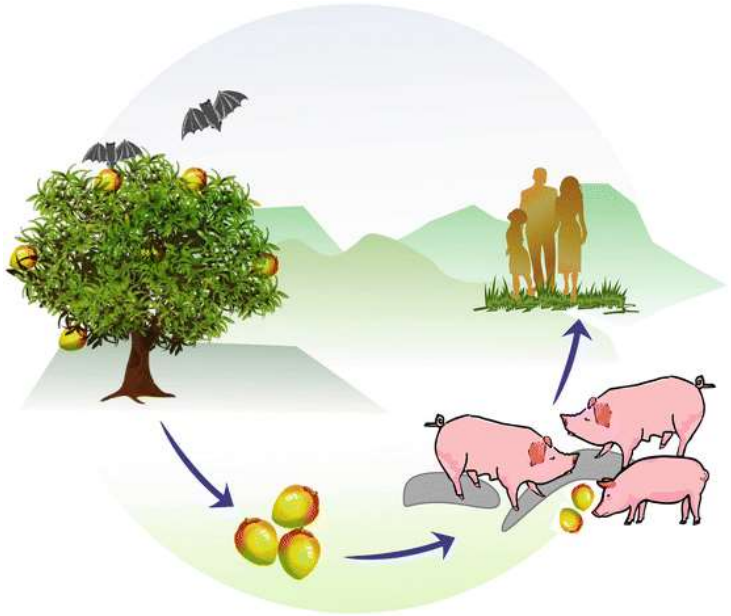
Environmental changes: Nipah virus outbreaks in SE Asia



Transmission cycle in Malaysia

Transmission cycle in Bangladesh

de Wit E., Munster V.J. (2015) Nipah Virus Emergence, Transmission, and Pathogenesis

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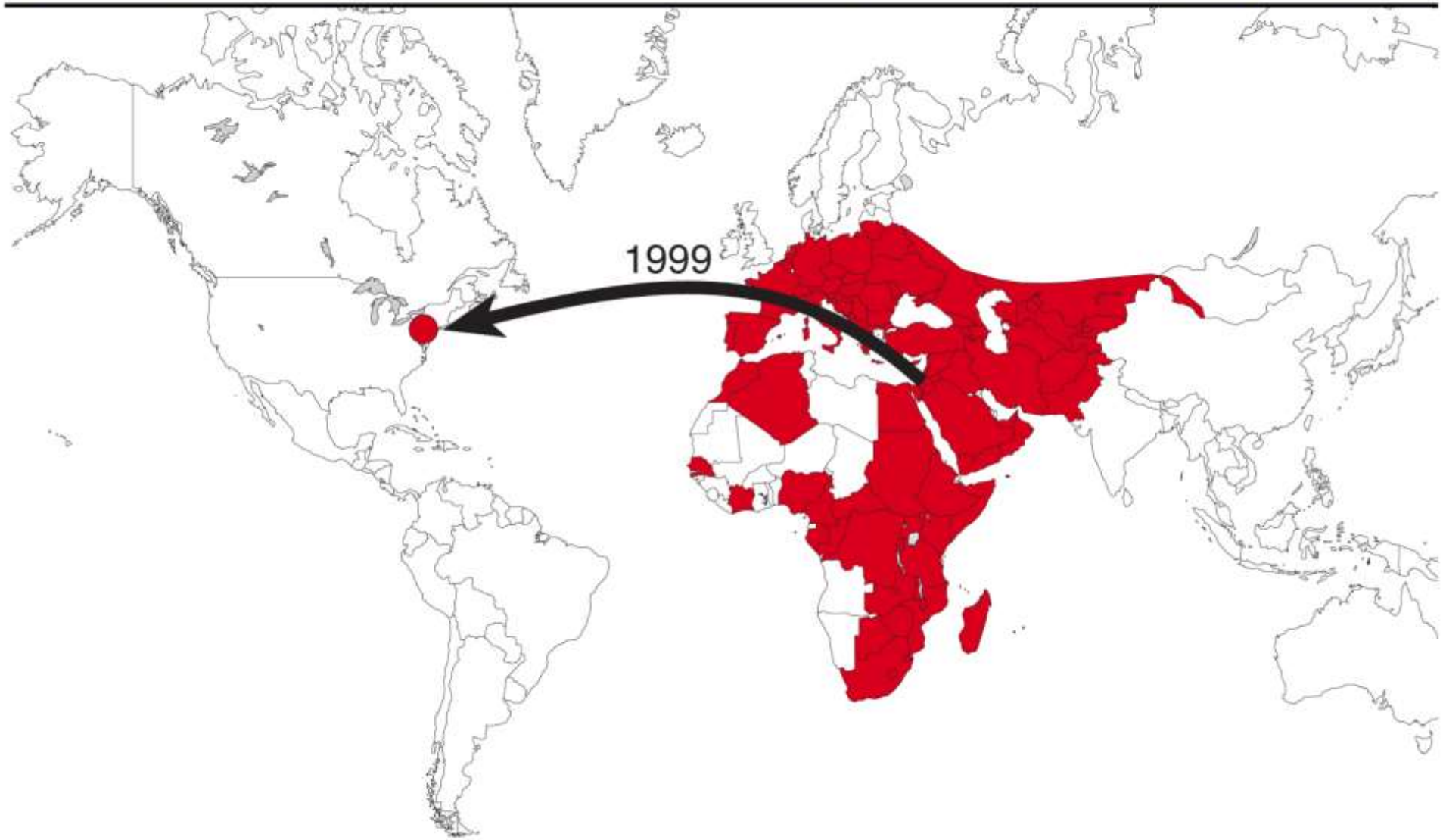
Factors That Affect The Spread Of Infectious Diseases

Photo credit: World Resources Institute

Global Distribution of West Nile Virus, 1999



Source: CDC

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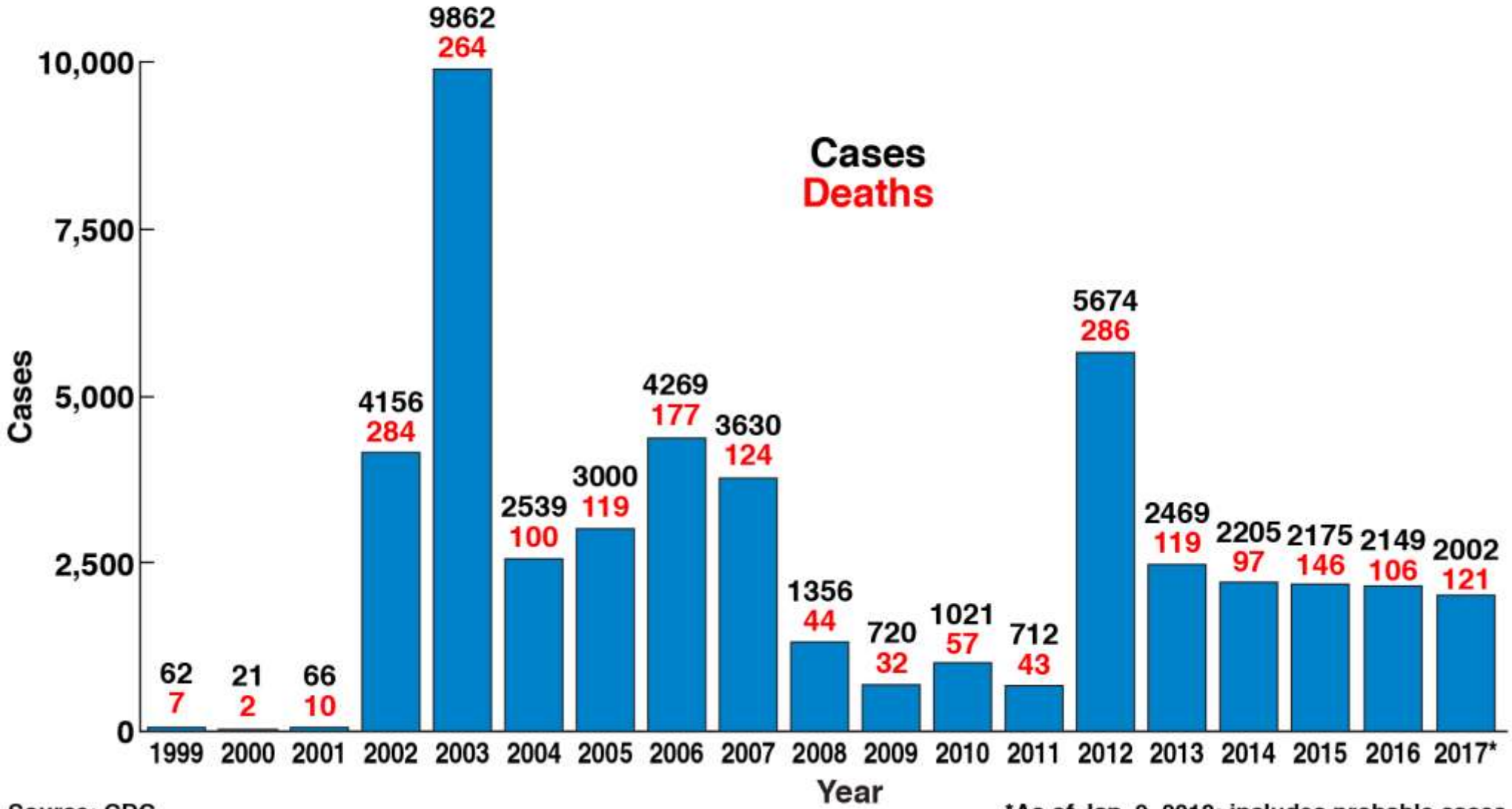
U.S. West Nile Virus Cases & Deaths, 1999-2017

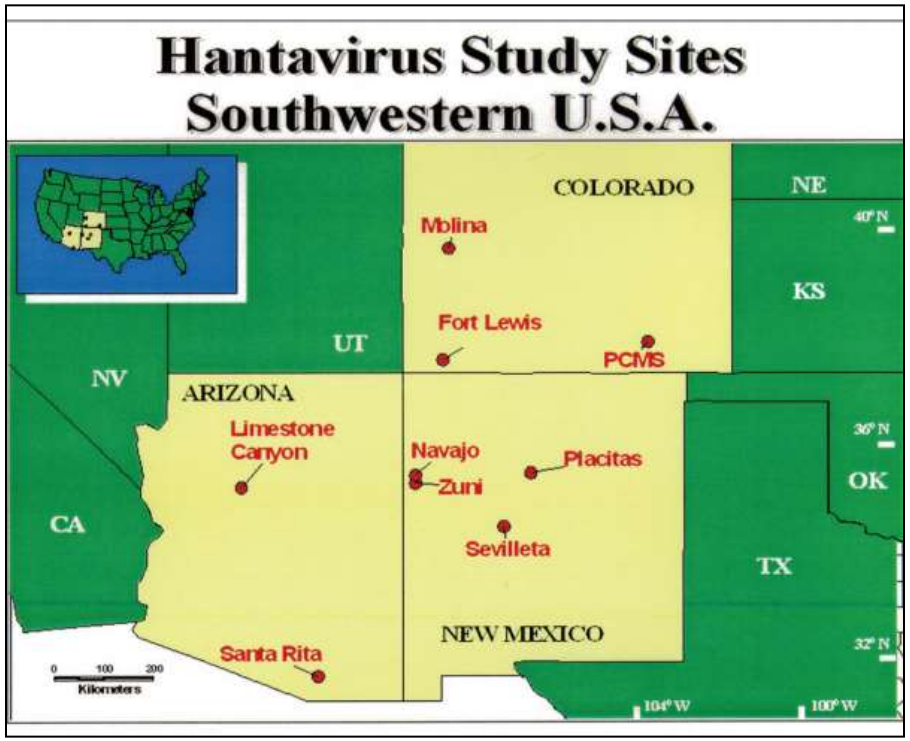


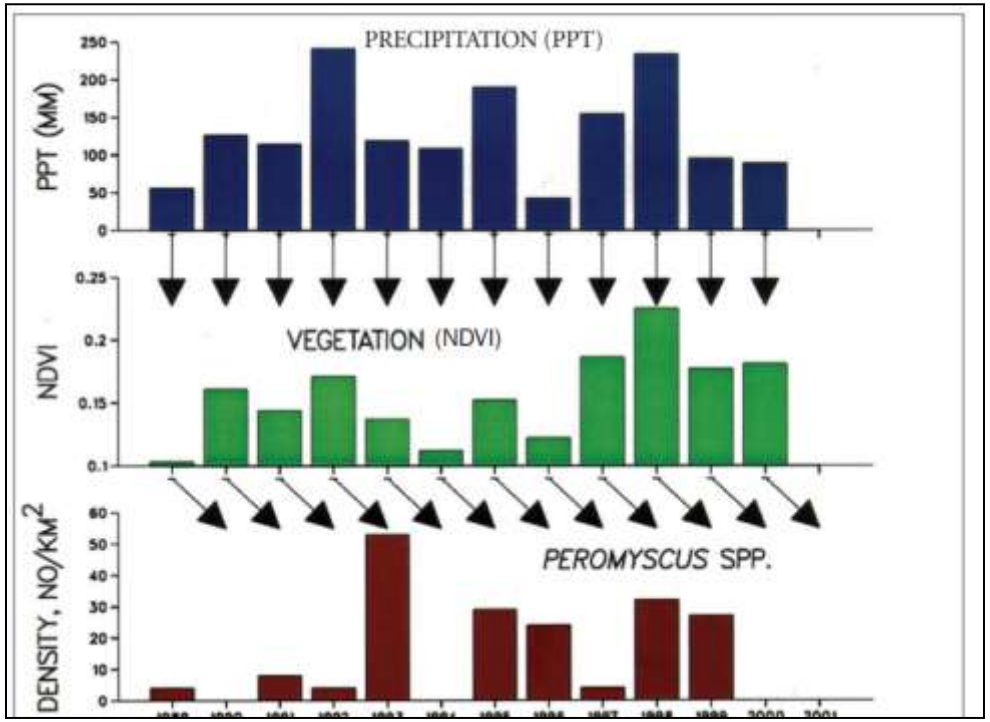
Source: CDC

*As of Jan. 9, 2018; includes probable cases

AS Fauci/NIAID

Climate changes
Hantavirus outbreak in the US SW in 1993





Bioscience (2002) 52, 989-998. doi: 10.1641/0006-3568(2002)052[0989:TEAEHO]2.0.CO;2

National Institute of Allergy and Infectious Diseases

National Institute of Allergy and Infectious Diseases

August 27, 2020

News Release

NIAID Establishes Centers for Research in Emerging Infectious Diseases

- Global network will involve multidisciplinary investigations into how and where pathogens emerge from wildlife and spillover to cause disease in humans

AS Fauci/NIAID

CREID Program Goals & Objectives

- Conduct innovative research to expand our knowledge of emerging and re-emerging infectious diseases and better prepare to respond to outbreak/pandemic threats
- Establish a collaborative, strategic and preemptive research Network to ensure coordination of efforts across the Network
- Develop and expand flexible domestic and international capacity and readiness to efficiently undertake research required in response to emerging or re-emerging threats
- Contribute to the development of the next generation of EID scientists and leaders

CREID
Centers for Research in Emerging Infectious Diseases

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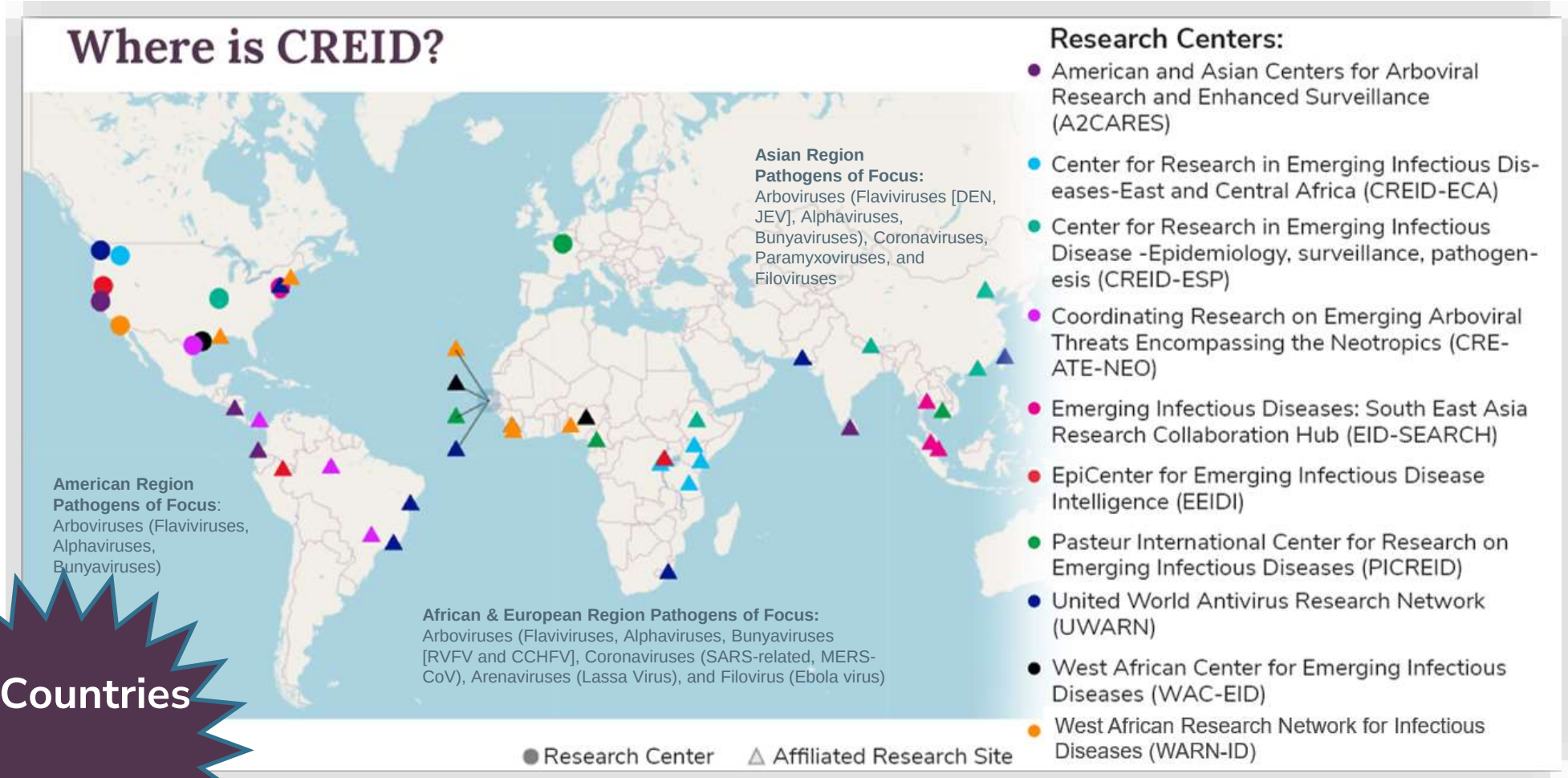


30 Countries

47 Research Sites

https://creid-network.org/

Centers of Excellence for Influenza Research and Response (CEIRR)

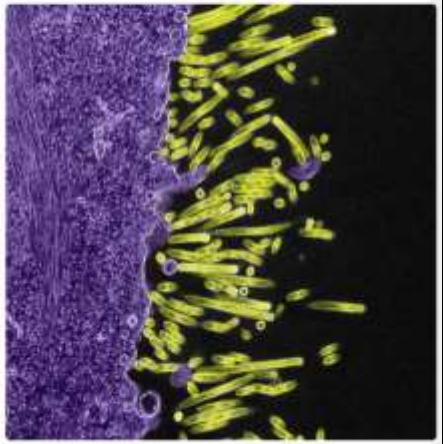
News & Events › Newsroom › News Releases

NIAID Funds New Influenza Research Network

April 14, 2021

The National Institute of Allergy and Infectious Diseases (NIAID), part of the National Institutes of Health, has established a network of research sites to study the natural history, transmission and pathogenesis of influenza and provide an international research infrastructure to address influenza outbreaks. The program, called the Centers of Excellence for Influenza Research and Response (CEIRR), is expected to be supported for seven years by NIAID contracts to five institutions. Funding for the first year of the contracts will total approximately $24 million. CEIRR will replace the Centers of Excellence for Influenza Research and Surveillance (CEIRS) program, which was supported by contracts that concluded on March 31, 2021.

The CEIRR sites will conduct studies in the United States and internationally that follow cohorts of people to evaluate influenza-related research areas, such as understanding immune responses to vaccination and infection and identifying which immunological factors can determine influenza disease severity. They also will undertake projects on influenza surveillance, including transmission of influenza viruses from animals to humans (zoonotic transmission) to better understand how influenza viruses evolve, adapt and transmit. The sites will prepare studies that could be rapidly launched as part of emergency research responses to outbreaks of influenza and other emerging viral pathogens.



Colorized transmission electron micrograph of swine influenza virus particles (green) attached to and budding from the surface of a cell (purple).

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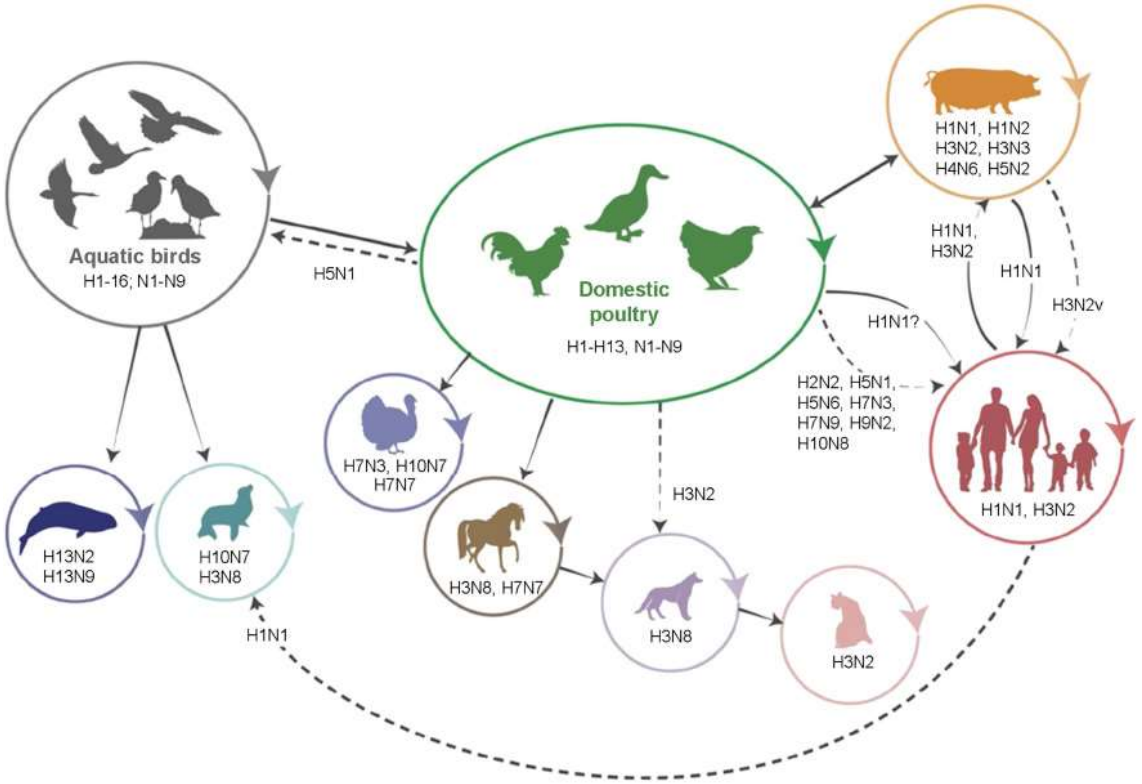
Scientific Need



- What causes some influenza viruses to emerge, transmit or cause disease and not others?
  - Factors that impact reassortment, transmission, and pathogenicity
  - Contributions of immune history to protection

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CEIRR Scope

Research

- Determine factors that influence the evolution, emergence, transmission and pathogenicity of influenza viruses
- Characterize the immune response to influenza infection and/or vaccination to improve understanding of protection

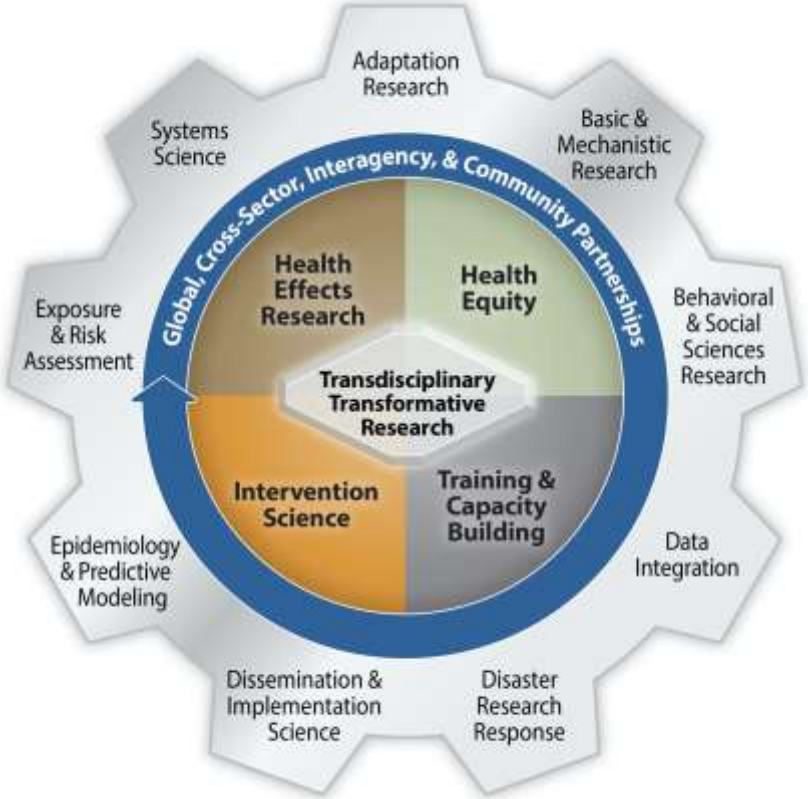
Response

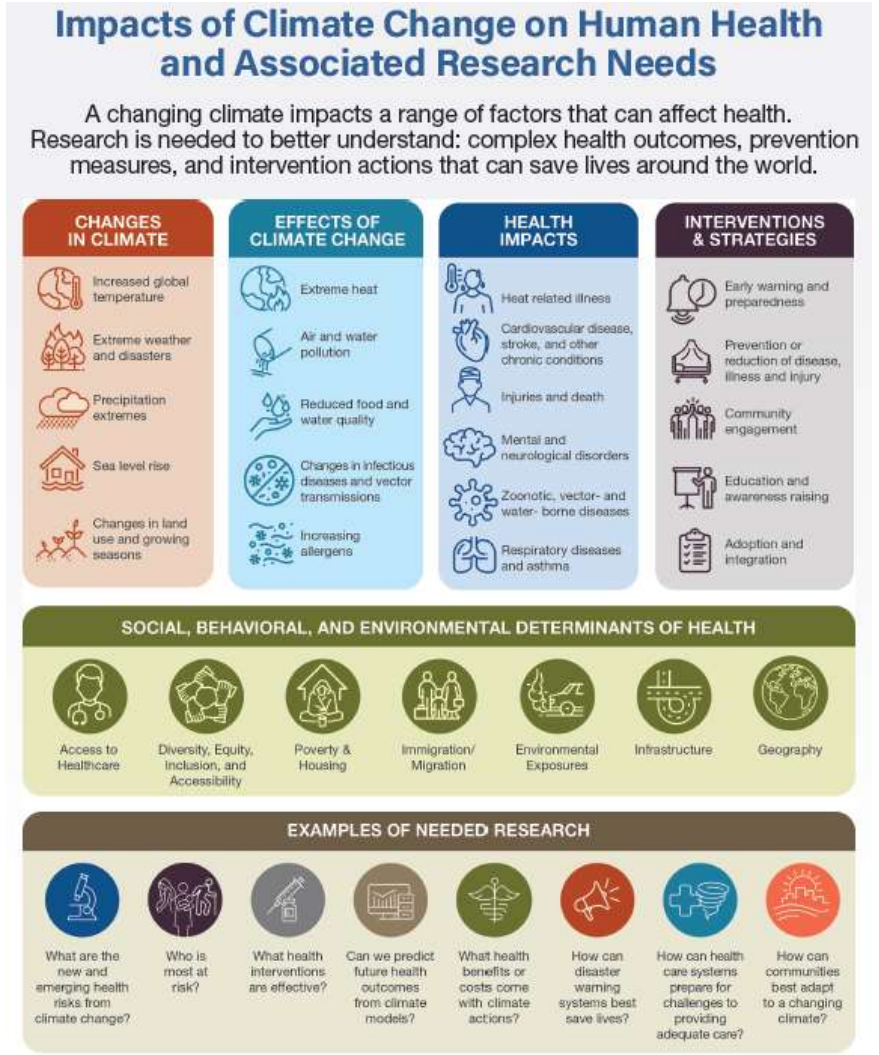
- Maintain an international research infrastructure to respond to emerging and pandemic influenza

Resource

- Develop research resources for the influenza community

NIH Strategic Framework Launched- February 2022

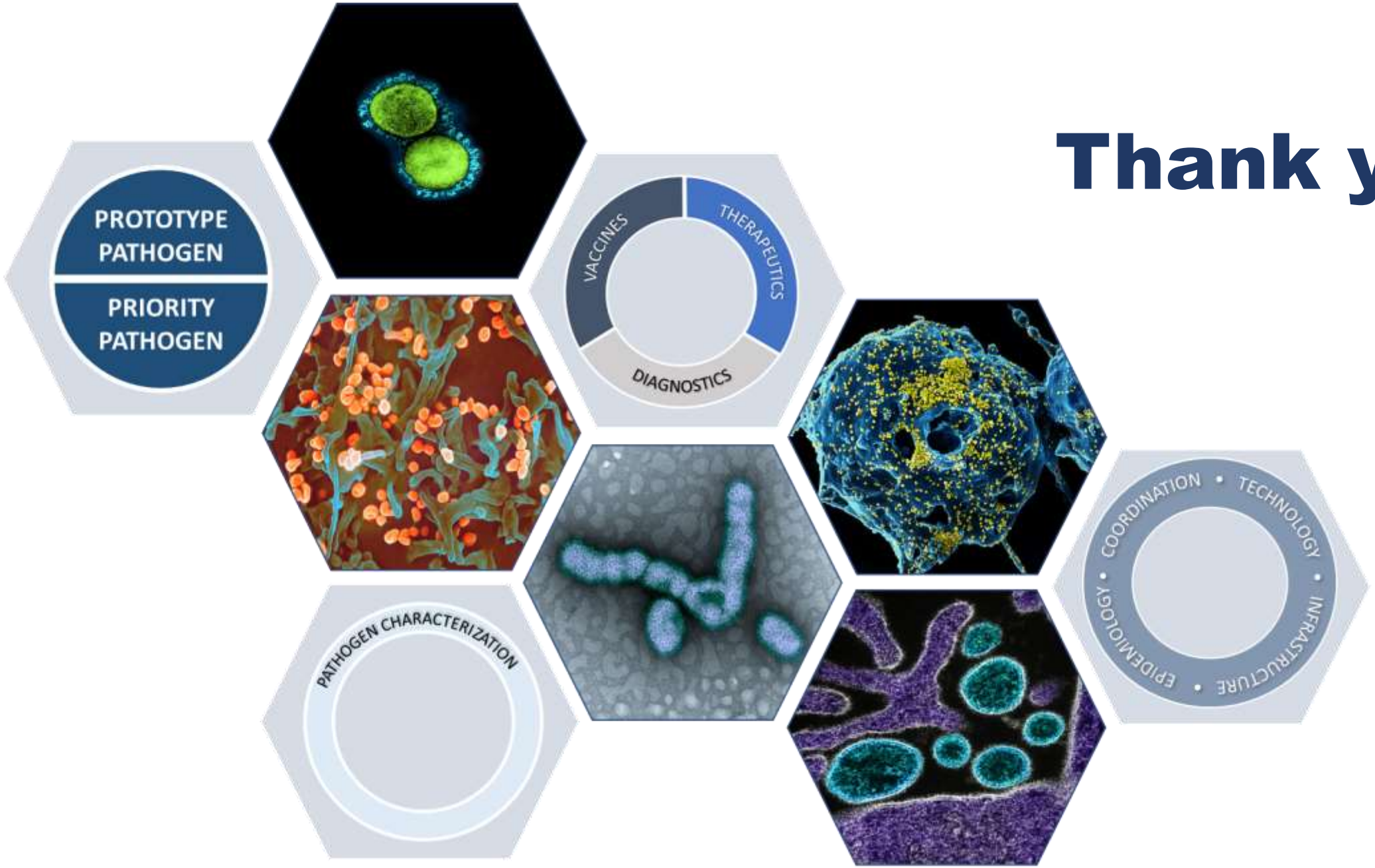




https://www.nih.gov/climateandhealth

Possible Areas for Collaboration

- Role of climate/specific environments in emergence, transmission and disease
- Environmental surveillance (in addition to animals and human survaillance)
- Integration of diverse sets of data to generate predictive algorithms
- ID modeling


PROTOTYPE PATHOGEN
PRIORITY PATHOGEN
VACCINES
THERAPEUTICS
DIAGNOSTICS
PATHOGEN CHARACTERIZATION
COORDINATION • TECHNOLOGY • INFRASTRUCTURE • EPIDEMIOLOGY •

Thank you

NIH Climate Change and Health Initiative FY 2022 Announcements

- **Research Coordinating Center for the Climate Change and Health Community of Practice**
  U24 – Clinical Trial Not Allowed: RFA-ES-22-003
  The Research Coordinating Center (RCC) will support the development of an inclusive Community of Practice (COP) of climate change and health researchers and trainees that fosters collaboration, capacity building, innovation and research.

- **Notice of Special Interest (NOSI): Climate Change and Health Administrative Supplements**
  NOT-TW-22-003
  NOSI for applications to supplement active NIH awards from the Institutes and Centers listed on the NOSI (FIC, NIBIB, NIDCD, NIDCR, NINR, NIMHD, NLM, NCCIH) to seed new activities and partnerships in climate change and health (CCH) research and research training.

- **Research Opportunity Announcement Alliance for Community Engagement- Climate and Health (ACE-CH)**
  NIH is soliciting applications from teams to conduct community-engaged research focused on climate change impacts on health and, the co-benefits of identifying the mitigation of climate change risks, vulnerabilities and adaptation.
  Uses Other Transactional Authority hosted by NHLBI

- **Notices of Special Interest: Innovative Technologies for Research on Climate Change and Human Health (SBIR/STTR)**
  NOT-ES-22-009 & NOT-ES22-010
  NOSI to develop or adapt practical technologies for capturing the effects of climate change and extreme weather events on human health and to reduce the health threats posed by climate change across the lifespan.

- **Notice of Special Interest: Climate Change and Health**
  NOT-ES-22-006
  NOSI encourages applications that address the impact of climate change on health and well-being over the life course, including the health implications of climate change in the United States and globally.

NIH Climate Change and Health Initiative FY 2023 Announcements

- **Exploratory Grants for Climate Change and Health Research Center Development (P20 Clinical Trial Optional)**
  RFA-ES-23-007
  Available Due Dates: May 01, 2023; November 07, 2023
  Expiration Date: Nov 8, 2023

- This program will support the development of an innovative research environment to foster and sustain a transdisciplinary program of fundamental and applied research to explore the complex impacts of climate change on health and to develop action-oriented strategies that protect health and build resiliency at the individual, community, national and global levels.

- Resources and partnership information to assist in developing robust and relevant research projects and core activities: https://www.niehs.nih.gov/research/programs/climatechange/research_program/p20/

- NIH will hold an **informational webinar/Q&A session March 24*, from 1:00pm-3:00pm EDT** on Zoom. (*Note the change of date from April 5 to March 24)
  Registration required
  at: https://nih.zoomgov.com/webinar/register/WN__5Qj2le4SxqHg9QrCMkcew

- **Notice of Special Interest (NOSI): Climate Change and Health Administrative Supplements**
  NOT-HD-23-006
  First Available Due Date: May 08, 2023
  Expiration Date: May 09, 2023

- As part of the NIH-wide Climate Change and Health Initiative, this NOSI invites applications to supplement active NIH awards to seed new activities and partnerships in climate change and health (CCH) research and research training. Applications for supplements to grants that are not currently focused on CCH but wish to include CCH measures and outcomes within the scope of their current research and training specific aims are encouraged.