



United States Department of Health & Human Services

# Modernizing the U.S. Influenza Vaccine Enterprise

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# Understanding the Threat of Influenza

- Seasonal influenza costs the United States approximately **\$361 billion** per year
- Severe pandemic could result in economic and social catastrophe
  - Economic damage ranges from **\$413 billion** to **\$3.79 trillion**
  - Major disruption to workforce and critical infrastructure and defense sectors



ESTIMATED RANGE OF ANNUAL INFLUENZA BURDEN IN THE UNITED STATES SINCE 2010, SOURCE: CDC



# Challenges to Influenza Preparedness and Response

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Domestic vaccine production is inefficient and insufficient



Vaccine effectiveness is less than optimal



Vaccination rates across the United States are too low



# Presidential Executive Order

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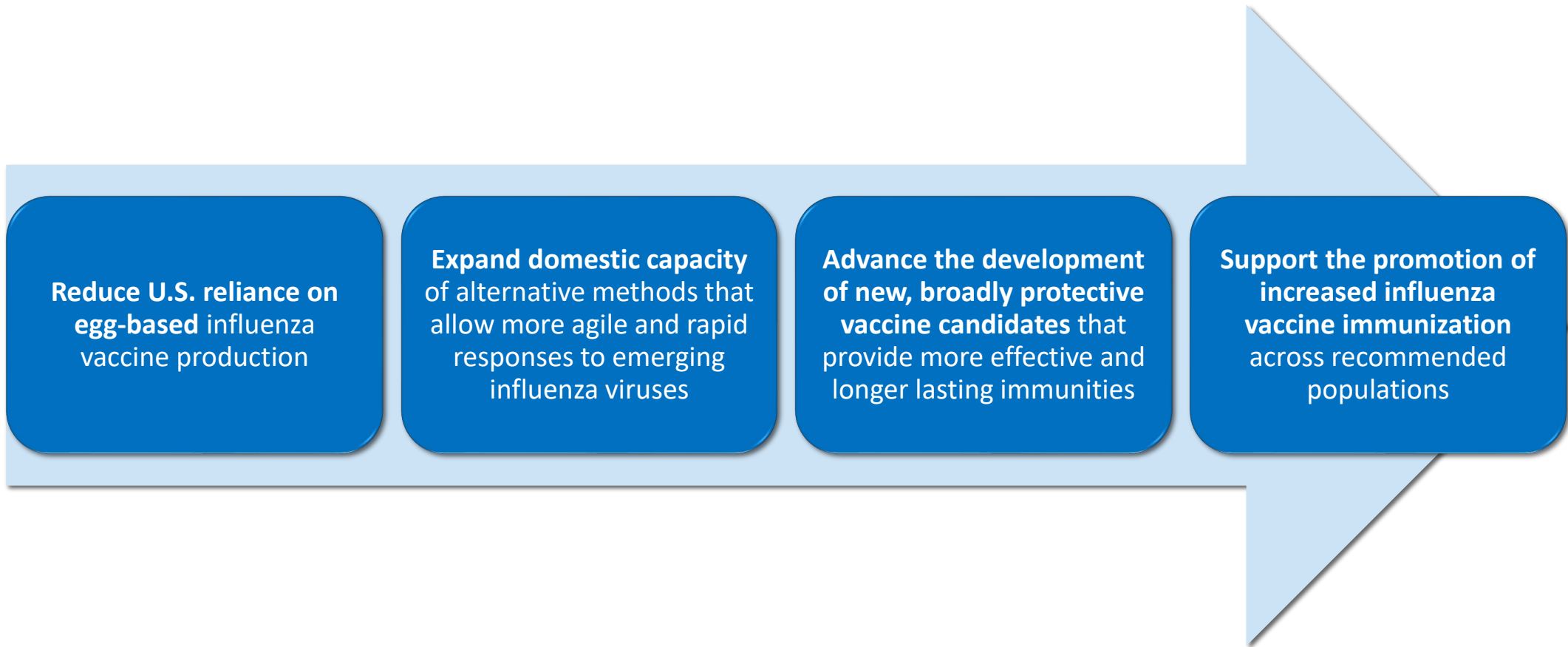
## **Presidential Executive Order (EO) 13887 Modernizing Influenza Vaccines in the United States to Promote National Security and Public Health**

Policy Intent: Establishes a National Influenza Vaccine Task Force to modernize the domestic influenza vaccine enterprise to be highly responsive, flexible, scalable, and more effective at preventing the spread of influenza viruses.



# EO Policy Objectives

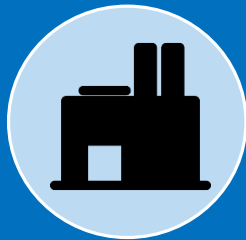
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# National Influenza Vaccine Modernization Strategy 2020-2030

**Vision: A domestic influenza vaccine enterprise that is highly responsive, flexible, scalable, and more effective at reducing the impact of seasonal and pandemic influenza viruses**



## Strategic Objective 1

Strengthen and diversify influenza vaccine development, manufacturing, and supply chain



## Strategic Objective 2

Promote innovative approaches and use of new technologies to detect, prevent, and respond to influenza



## Strategic Objective 3

Increase influenza vaccine access and coverage across all populations



United States Department of Health & Human Services

# National Influenza Vaccine Task Force

<b>National Influenza Vaccine Task Force</b>
<b>Department of Health and Human Services (HHS) – Co-Chair</b>
Assistant Secretary for Preparedness and Response (ASPR) (Co-Chair)
Biomedical Advanced Research and Development Authority (BARDA)
Centers for Disease Control and Prevention (CDC)
Centers for Medicare and Medicaid Services (CMS)
Food and Drug Administration (FDA)
National Institutes of Health (NIH)
National Institute of Allergy and Infectious Diseases (NIAID)
Office of the Assistant Secretary for Health (OASH)
<b>Department of Defense (DoD) – Co-Chair</b>
Assistant Secretary of Defense for Health Affairs (Co-Chair)
Office of the Assistant Secretary of Defense for Homeland Defense and Global Security
Office of the Assistant Secretary of Defense for Nuclear, Chemical, and Biological Defense Programs
Office of the Director of Defense Research and Engineering for Research and Technology
<b>Department of Agriculture (USDA)</b>
<b>Department of Homeland Security (DHS)</b>
<b>Department of Justice (DoJ)</b>
<b>Department of Veterans Affairs (VA)</b>
Veterans Health Administration (VHA)



United States Department of Health & Human Services

# Thank You

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Kristin DeBord, PhD  
Acting Director

Office of the Assistant Secretary for Preparedness and Response  
Office of Strategy, Policy, Planning, and Requirement



# **Implementing the NIAID Strategic Plan for a Universal Influenza Vaccine**

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**Alan Embry, PhD**

**Chief, Respiratory Diseases Branch**

**Division of Microbiology & Infectious Diseases**

**NIAID, NIH, DHHS**



# Adjusted Influenza Vaccine Effectiveness Estimates in the U.S.



Source: CDC

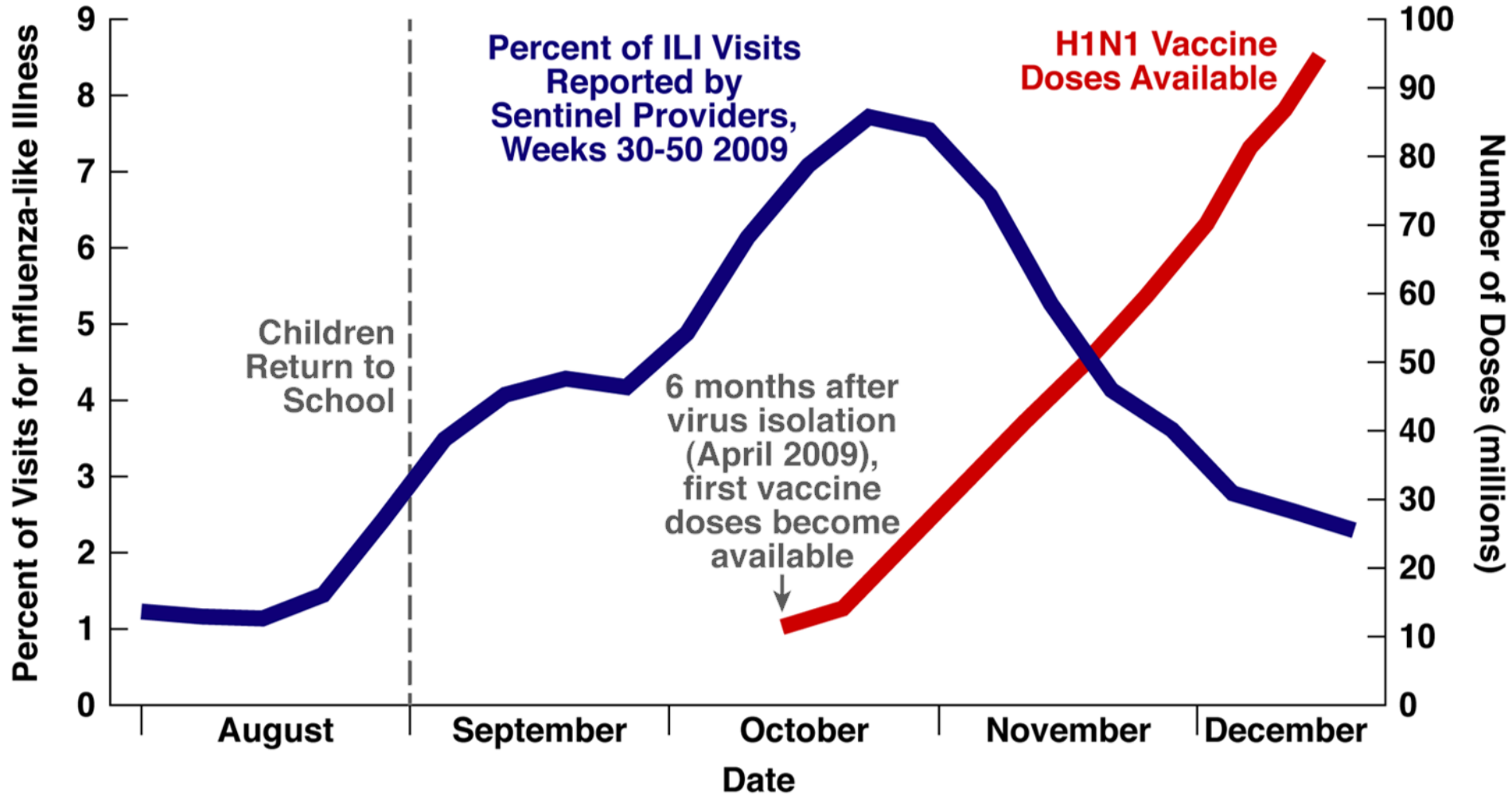
AS Fauci/NIAID

# Influenza Pandemics Occur

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<b>Year</b>	<b>Subtype</b>	<b>Deaths</b>
<b>1918</b>	<b>H1N1</b>	<b>&gt;50 million</b>
<b>1957</b>	<b>H2N2</b>	<b>&gt;1 million</b>
<b>1968</b>	<b>H3N2</b>	<b>&gt;1 million</b>
<b>2009</b>	<b>H1N1</b>	<b>~151K-575K</b>

# Vaccine Lags Behind 2009 H1N1 Influenza Pandemic



# NIAID Universal Influenza Vaccine Targets

## A universal flu vaccine should



Be at least 75% effective



Protect against group I and II influenza A viruses

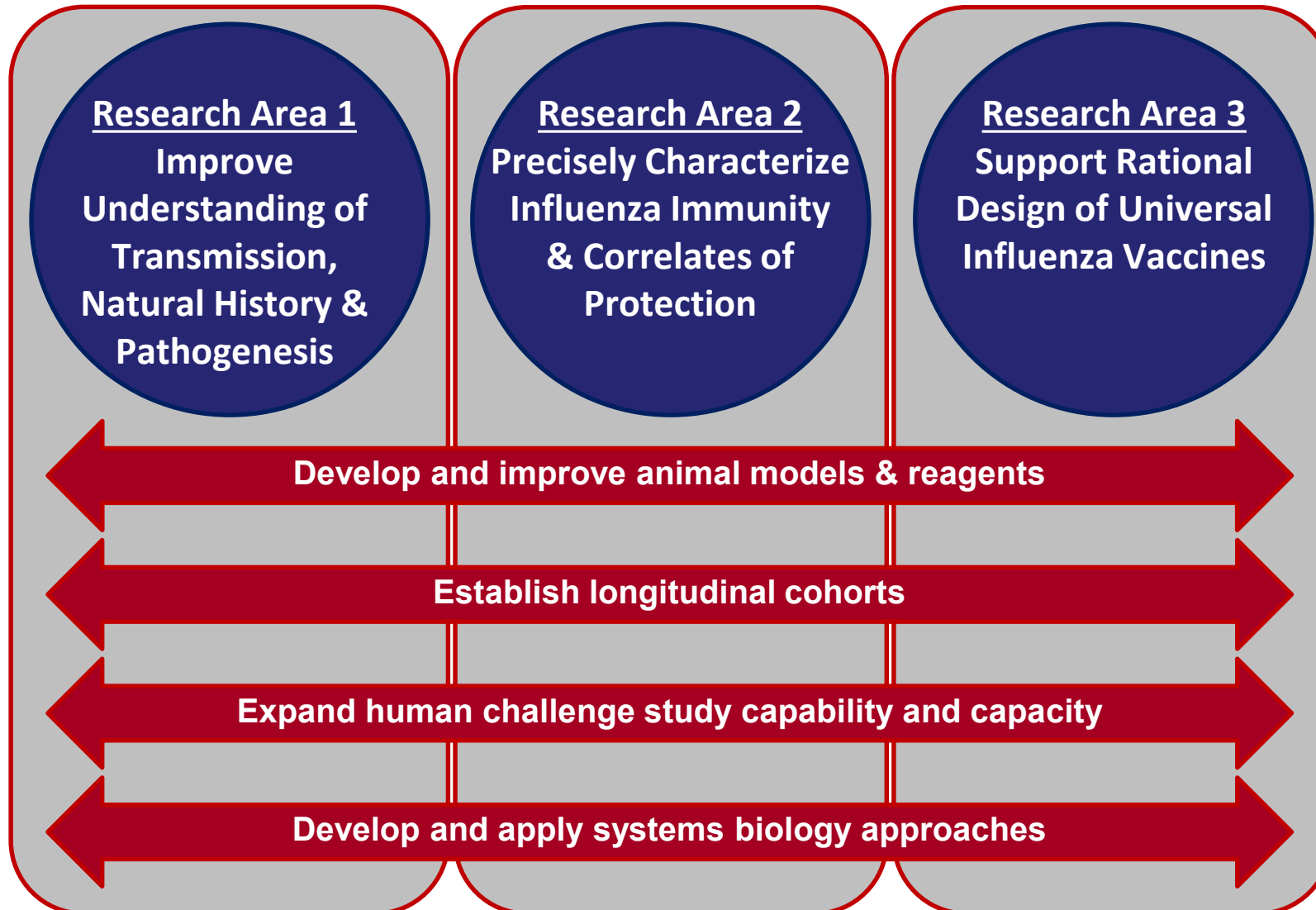


Have durable protection that lasts at least 1 year

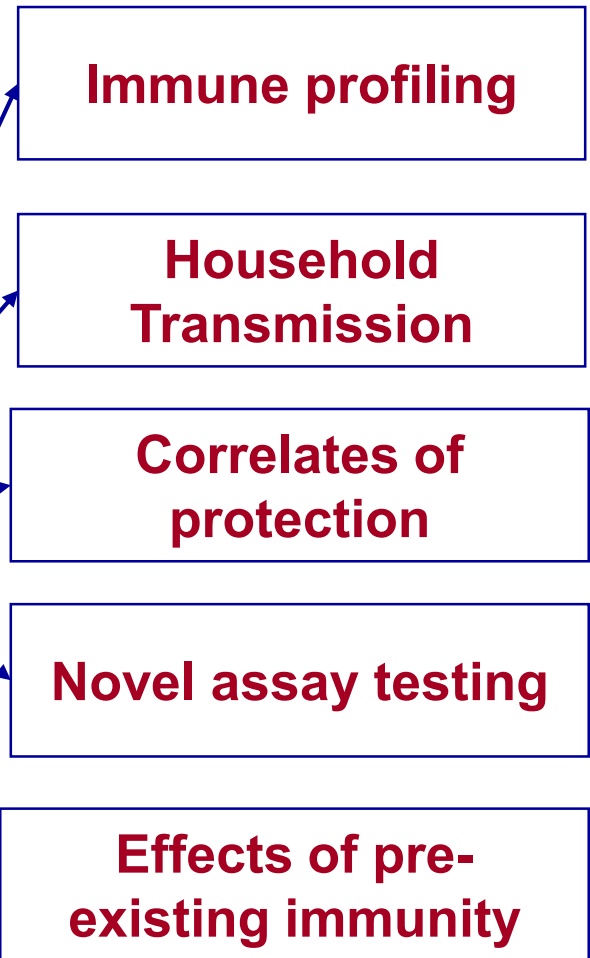


Be suitable for all age groups

# NIAID Universal Influenza Vaccine Strategic Plan



# Longitudinal Cohort Studies To Advance Universal Influenza Vaccines



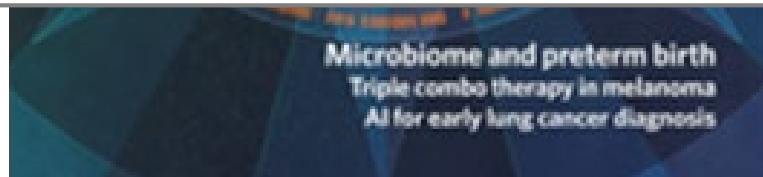
- 5 new cohorts funded through NIAID CEIRS
- Studies to understand immunity after infection and vaccination

# CEIRS Household Transmission Study



**Novel correlates of protection against  
pandemic H1N1 influenza A virus  
infection**

***Ng S et al. 2019***



- **HA stalk antibodies independently protective against infection**
- **NA antibodies were not independently protective**
- **Findings suggest stalk antibodies are a correlate of protection against influenza in a natural setting**



# Impact of Initial Influenza Exposure on Immunity in Infants

**Longitudinal cohorts of infants** to determine how initial and repeated infections and/or vaccinations shape immunity to future influenza exposures



## Dissection of Influenza Vaccination and Infection for Childhood Immunity (DIVINCI)

Paul Thomas, Ph.D.

- Los Angeles
- New Zealand
- Nicaragua



## The Influenza IMPRINT Cohort

Mary Allen Staat, M.D., M.P.H.

- Cincinnati
- Mexico City



# Expanding Influenza Human Challenge Capacity

- **Manufacturing 2 challenge strains**
  - **H1N1 (Clade 6B.1)**
  - **H3N2 (Clade 3C3a)**
- **Conducting challenge study at 4 NIAID VTEU sites**
  - **Fully enrolled (n=80)**
  - **H1N1pdm09 strain from Matt Memoli**



NIH researchers infect volunteers with the flu virus in an ongoing effort to improve vaccines. AP PHOTO/CHARLES DHARAPAK

Studies that intentionally infect people with disease-causing bugs are on the rise

By [Jon Cohen](#) | May. 18, 2016, 3:00 AM

# CIVICs: A Comprehensive Program for Universal Influenza Vaccine Development

## External Advisory Board

### Vaccine Centers

- Iterative vaccine design, preclinical testing and in-depth immunologic analyses
- Assay & reagent development



Manufacturing &  
Toxicology Core



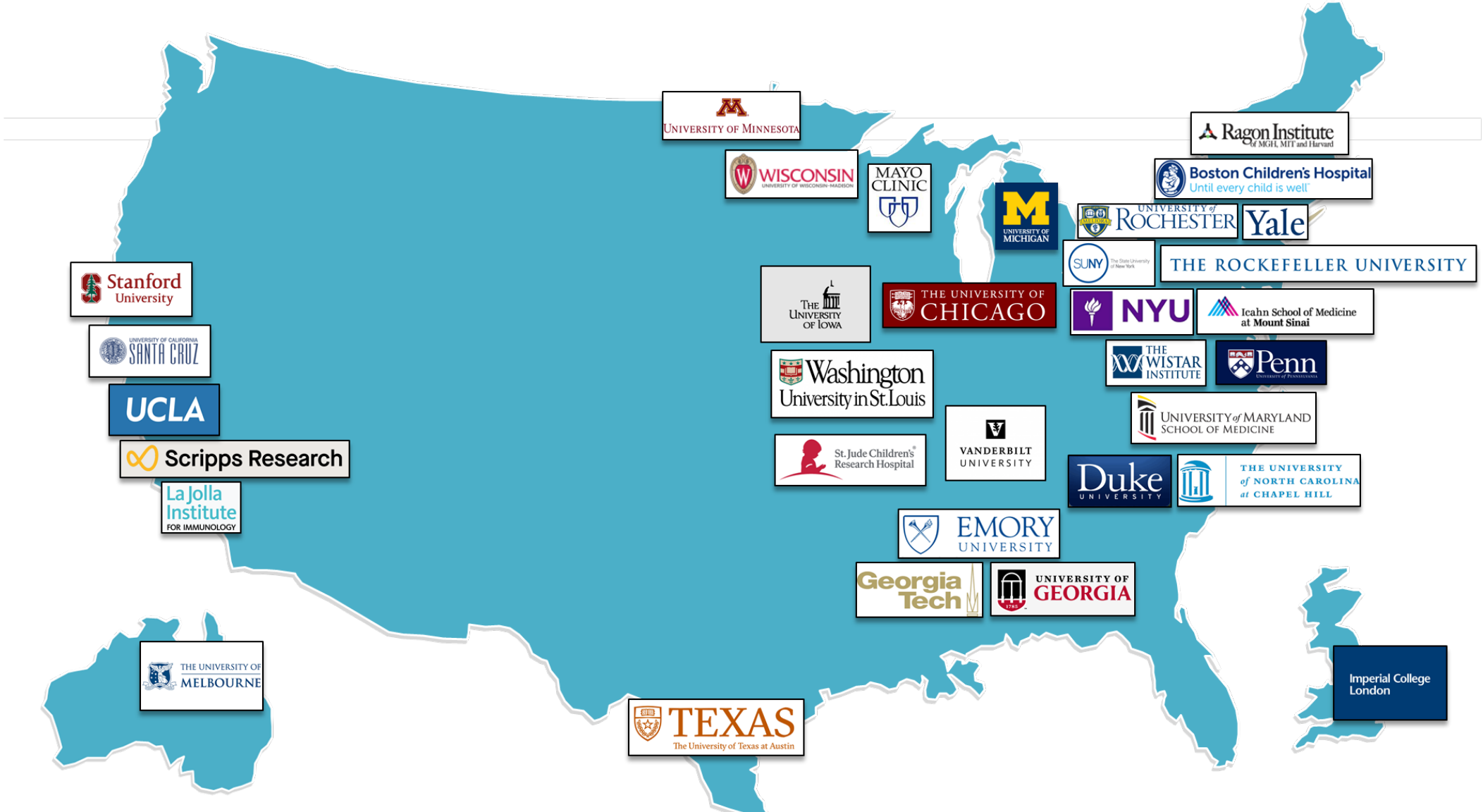
Clinical  
Cores



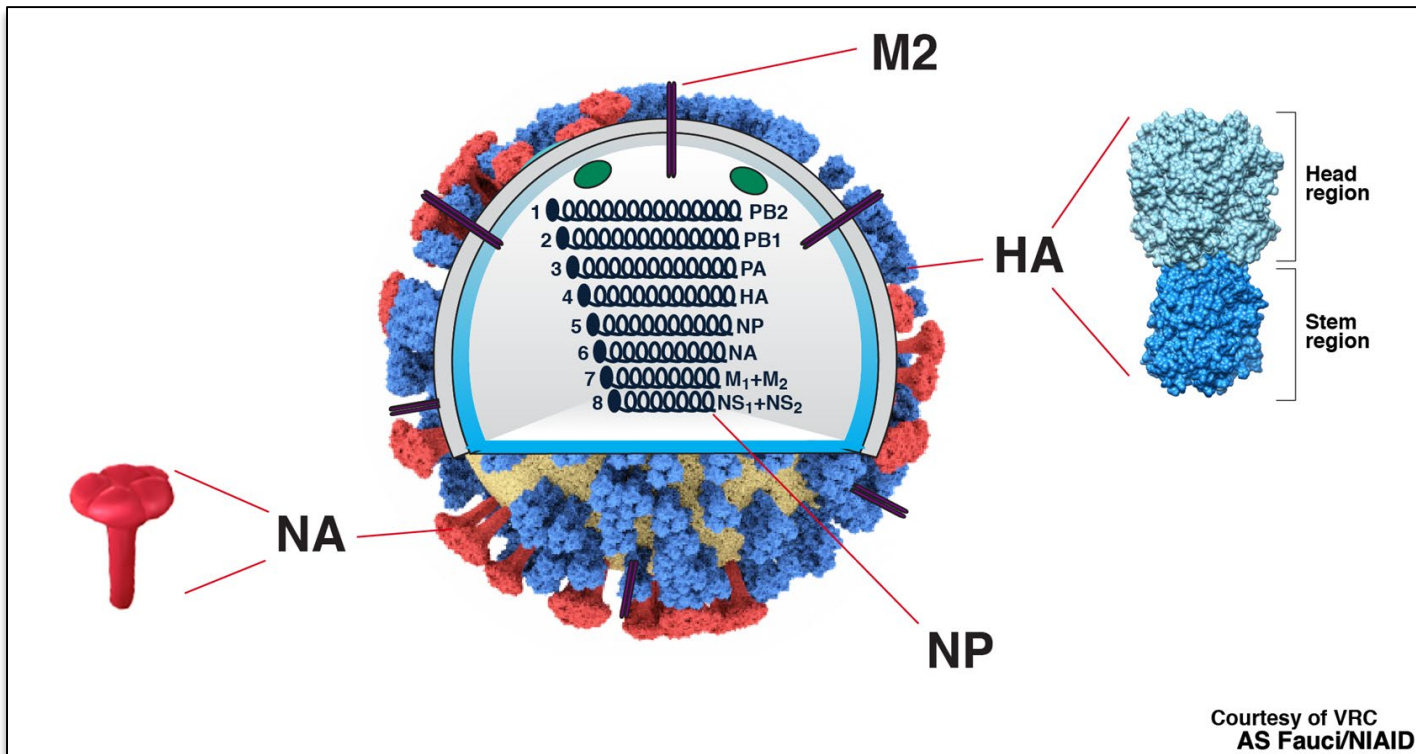
Statistical, Data  
Management &  
Coordination Center  
(SDMCC)



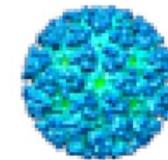
# Multidisciplinary Network to Accelerate Development of Universal Influenza Vaccines



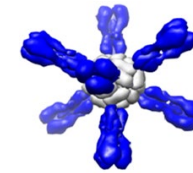
# A Broad Spectrum of Approaches



Recombinant protein



LAIVs, VLPs



Nanoparticle



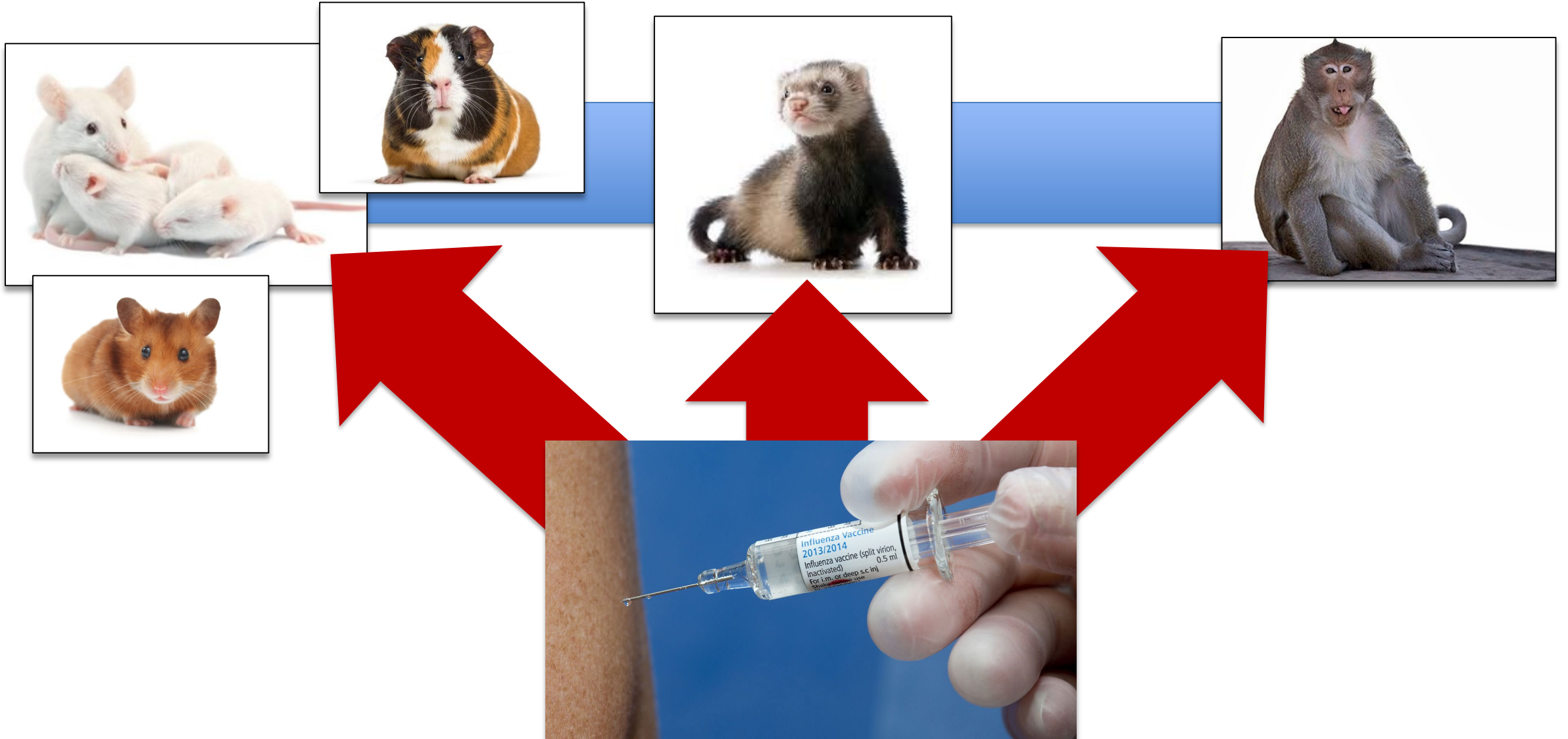
DNA, RNA



Microneedle patch



# Iterative Design and Development



# Iterative Design and Development

## A universal flu vaccine should



Be at least 75% effective



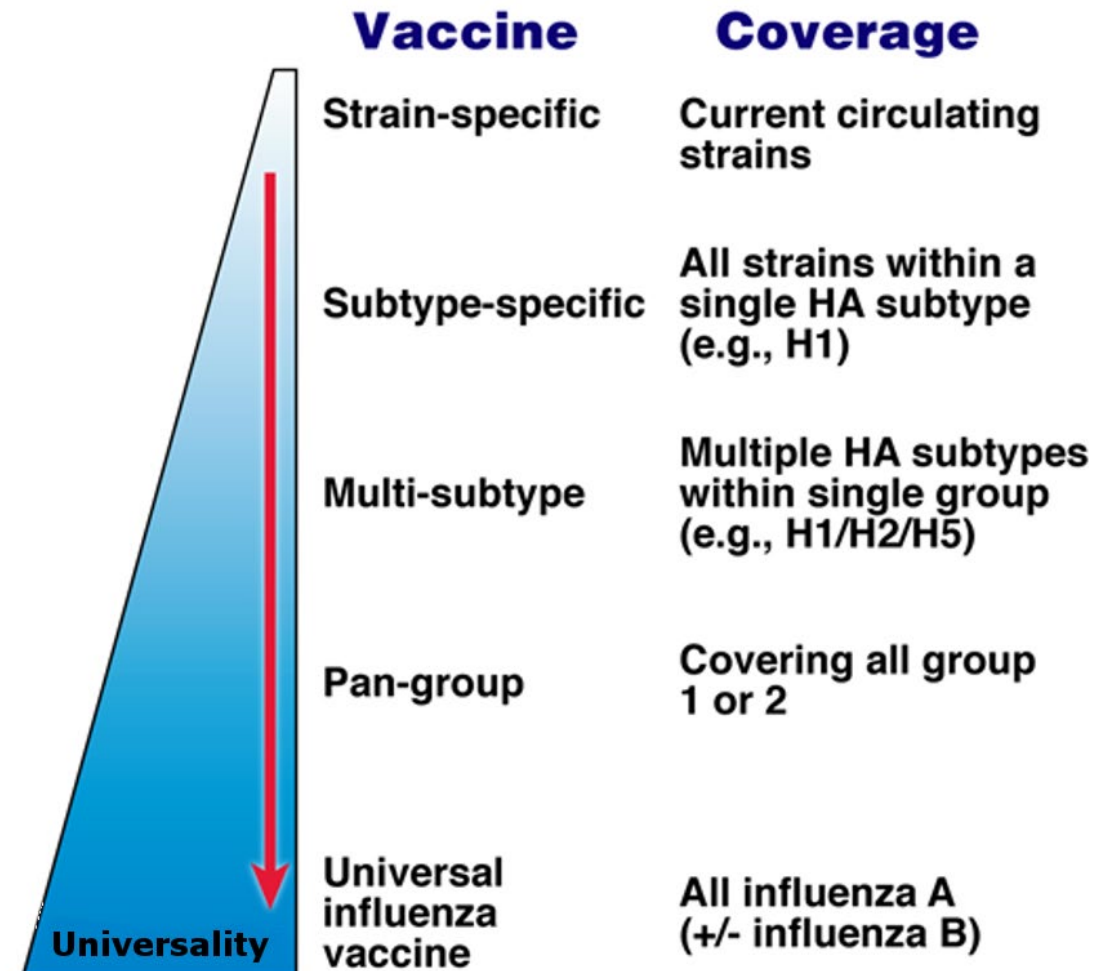
Protect against group I and II influenza A viruses



Have durable protection that lasts at least 1 year



Be suitable for all age groups



# NIAID-Supported Clinical Trials Informing Universal Vaccine Strategies



## RedeeFlu (M2SR LAIV)

- Phase I H3N2 MRSR prime and IIV4 boost in pediatric subjects



## M-001 Peptide Vaccine

- Phase II M-001 prime and IIV3/IIV4 boost in healthy adults



## Imiquimod (Aldara) Topical Adjuvant

- Phase II: Imiquimod with H5N1 vaccine in healthy adults



## Sanofi Mix and Match Study

- One dose of either the Fluzone<sup>®</sup> or Flublok<sup>®</sup>, given alone or with either AF03 or Advax-CpG55.2<sup>™</sup> adjuvant



# FY21 Council Approved Concepts

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- **Centers of Excellence for Influenza Research and Response**
  - Human studies & cohorts
  - Non-human surveillance in areas at risk for spillover
- **Multidisciplinary Studies to Improve Understanding of Influenza Transmission**
  - Innovative sampling, viral particle characterization, animal & human studies to understand influenza transmission
- **Partnerships for the Development of Universal Influenza Vaccines**
  - Development of vaccines that protect against both influenza A & B viruses or the addition of influenza B components to existing influenza A candidates