

# COVID-19 Research at the University of Minnesota

## Prospects for a Vaccine

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Professor of Medicine and Infectious Diseases





# World Health Organization

## Emergencies preparedness, response

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[Alert and response operations](#)

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[Disease outbreak news](#)

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### **Pneumonia of unknown cause – China**

Disease outbreak news

5 January 2020

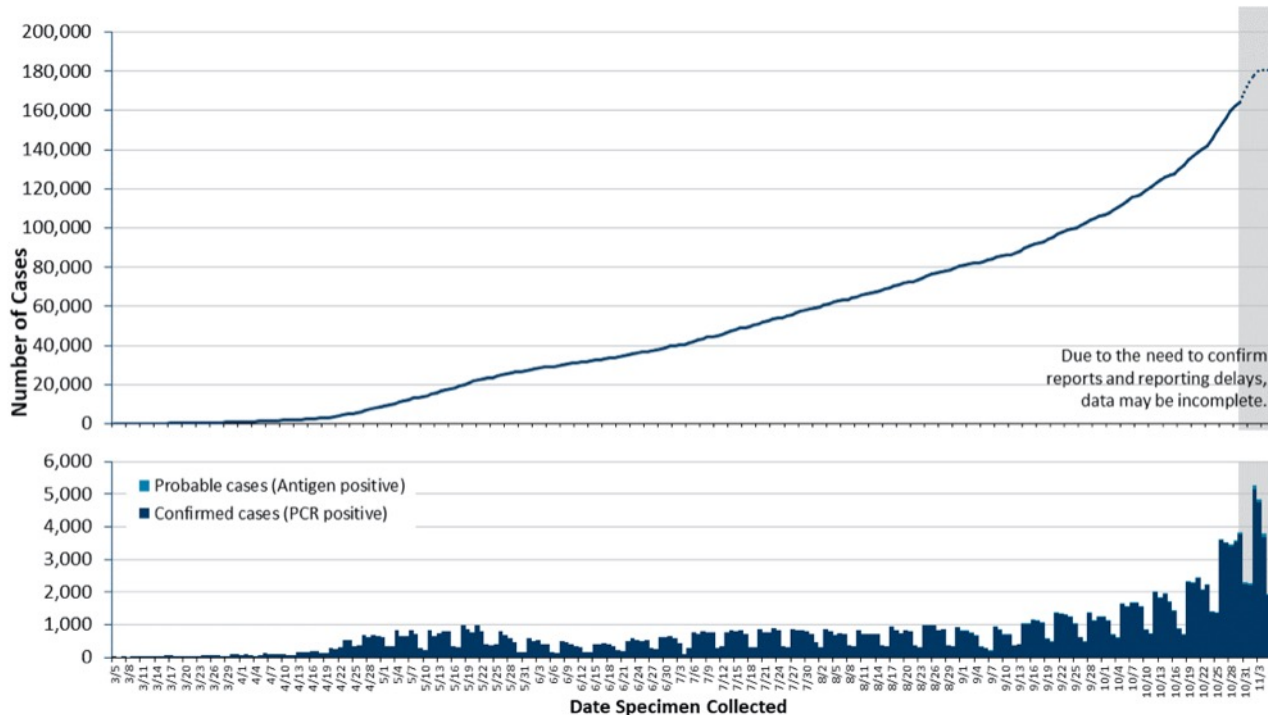
On 31 December 2019, the WHO China Country Office was informed of cases of pneumonia of unknown etiology (unknown cause) detected in Wuhan City, Hubei Province of China. As of 3 January 2020, a total of 44 patients with pneumonia of unknown etiology have been reported to WHO by the national authorities in China. Of the 44 cases reported, 11 are severely ill, while the remaining 33 patients are in stable condition. According to media reports, the concerned market in Wuhan was closed on 1 January 2020 for environmental sanitation and disinfection.

# COVID-19 Case Rates

(Nov. 8, 2020)

	Global	U.S.	Minnesota
Total Cases	50,052,204	9,879,323	180,862
Total Deaths	1,256,110	237,192	2,656
Mortality	2.5%	2.4%	1.5%

## Minnesota Case Overview



# 1918 Influenza Pandemic: ~ 50 million deaths



## Help Bar Deadly Influenza From Seattle

By DR. J. D. TUTTLE,  
State Health Commissioner

Don't get into crowds, don't cough or sneeze without using a handkerchief, get plenty of fresh air, and when the symptoms of a cold appear isolate yourself as far as possible from others.

By SURGEON GENERAL RUPERT BLUE,  
U. S. Public Health Service

First there is a chill, then fever, headache, backache, reddening of the eyes, aches all over the body and general prostration. Persons so attacked should go to bed at once and call a physician.

**NIGHT EXTRA** FOR INFORMATION  
 SEATTLE, WASHINGTON, SATURDAY EVENING, OCT. 5, 1918. Price 10c

**The Seattle Daily Times**

**TIMES WHISTLE SIGNALS**

## CHURCHES, SCHOOLS, SHOWS CLOSED

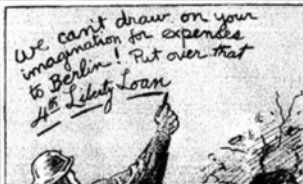
### EPIDEMIC PUTS BAN ON ALL PUBLIC ASSEMBLIES

#### MR. LOVERING'S COMMENT

Mayor and City Health Officer Will Permit Shows Not Gatherings in Open Air.

#### SEATTLE TO MAKE FIGHT ON DISEASE

Police Ordered to Close Public Places



#### AMERICANS AND FRENCH SMASH FOE

Associated Press Summary





**SORRY** did my   
**CIVIL RIGHTS**  
Get in the way of  
Your  **VIRUS ?**

# Mask controversy in 1918 Influenza pandemic



**ANTI-MASK  
MEETING**  
**TONIGHT (Saturday) JAN. 25**  
**DREAMLAND RINK**  
To Protest Against the Unhealthy Mask Ordinance





Even before a coronavirus vaccine becomes available, some activists are ready to attack it; this woman attended a “Reopen Virginia” protest in Richmond in April. MATTHEW RODIER/SIPA USA/AP IMAGES

## Just 50% of Americans plan to get a COVID-19 vaccine. Here’s how to win over the rest

By [Warren Cornwall](#) | Jun. 30, 2020 , 4:25 PM





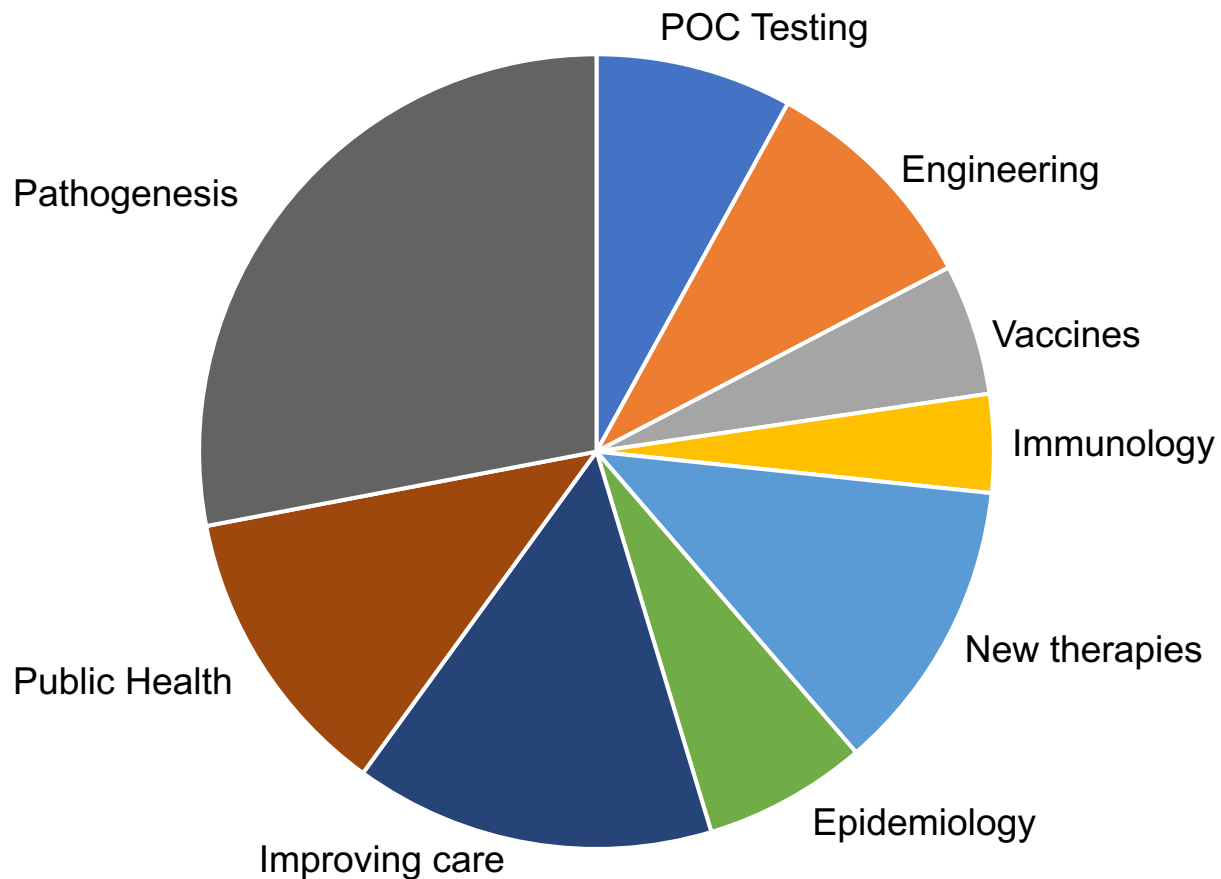
BEWARE! THE VACCINE

From a French caricature of the XVIII century



# Medical School Rapid Response Grants

- 170 rapid response grants received (161 basic science, 9 clinical research)
- Funded 75 grants
- Total awarded \$818,659



# Molecular diagnostics for SARS-CoV-2 (PCR of nasal swabs)

- Designed a PCR test independent of a supply chain in less than 1 week
- Established a new diagnostic laboratory in the Microbiology Research Facility in less than 1 week
- Partnered with U of MN's Genomics Center to rapidly increase capacity
- Increased testing capacity from 100 /day to 10,000 tests / day in 3 months
- Partnered with Veterinary Diagnostic Lab to increase capacity
- Developing new technologies to increase capacity (e.g., extractionless assay)
- Established the COVID lab at ARDL to restore MRF to Pre-CoVID function
- Established MN Testing Partnership with Mayo Clinic and MDH to meet daily needs of MN
  - As of October 25, we have performed more than 545,000 tests



Sophia Yohe, MD



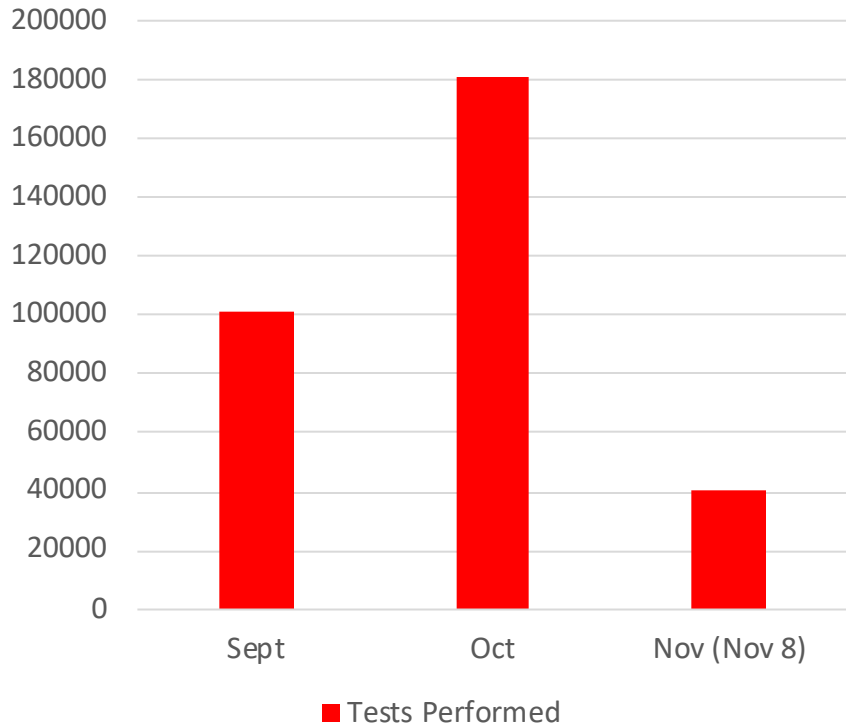
Andrew Nelson, MD, PhD



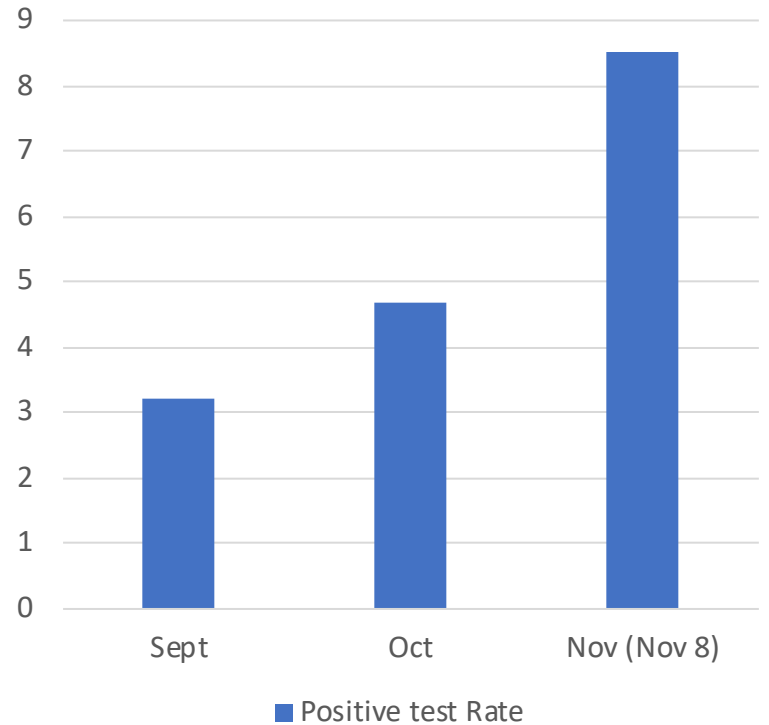
Kenny Beckman, PhD

# Testing Activity Sept-Nov 8

## Tests Performed

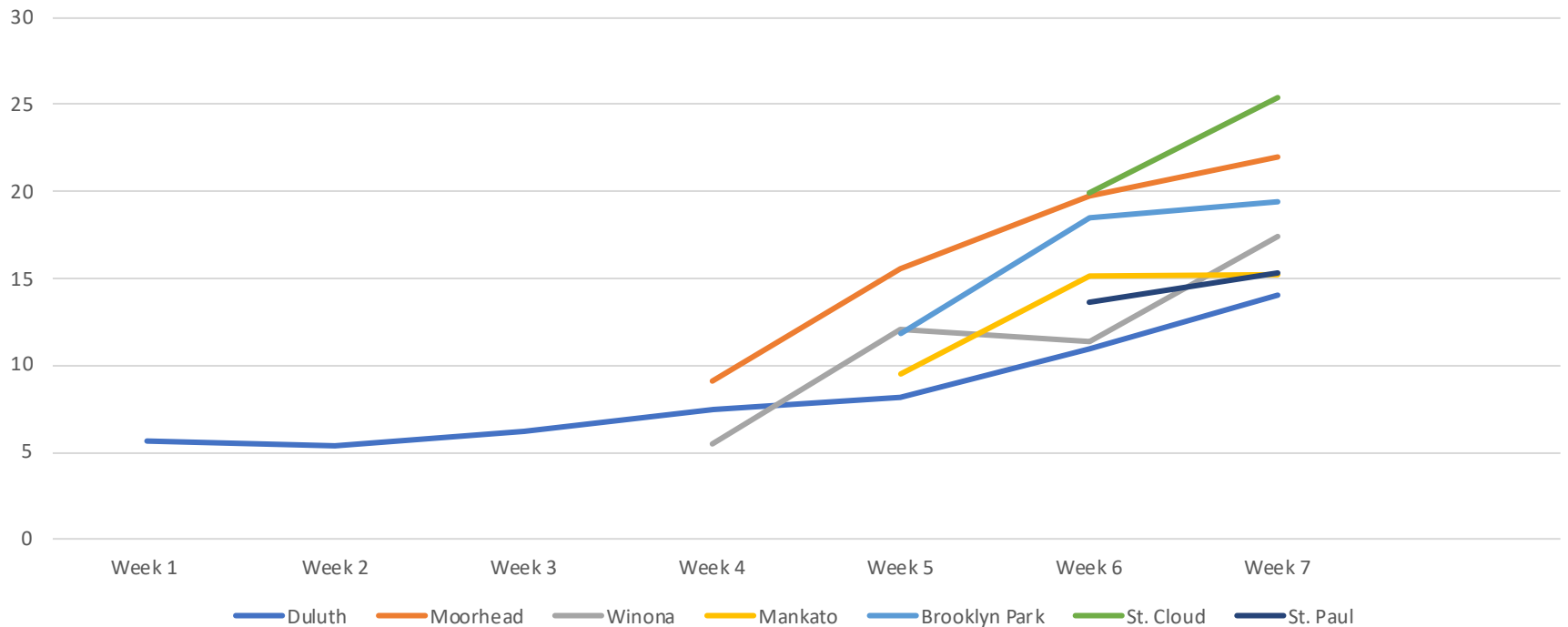


## Positive Test Rate (% of all tests)





# Increasing Rate of Detection With MDH Saliva Testing



# SARS-CoV-2 Antibody test



Marc Jenkins, PhD



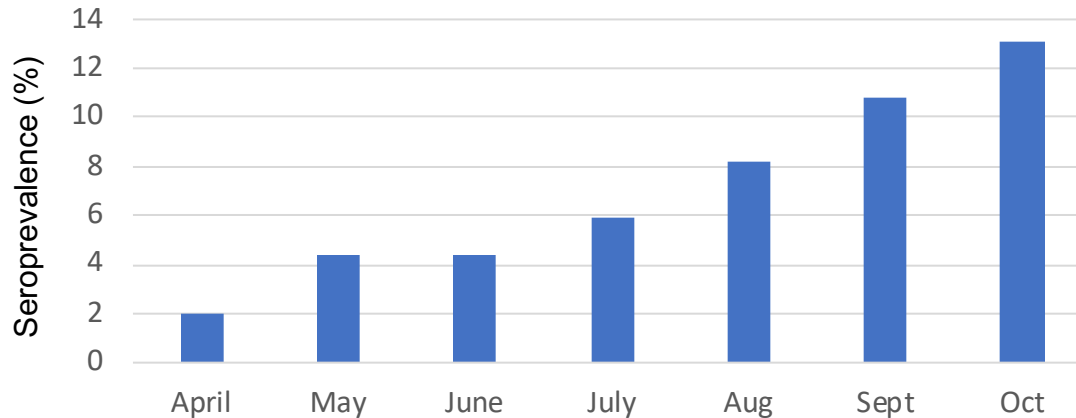
Amy Karger, MD, PhD

**March 29:** Began developing serology assay (antibody test)

**April 6:** Antibody test transitioned to Advanced Research and Diagnostic Laboratory

**April 13:** Validated antibody test for clinical use

Current capacity: **15,000–20,000 tests/day**



# Wastewater Detection of SARS-CoV-2

- Can we use samples collected from regional wastewater plants to act as an “early warning system”?
- Twice weekly sampling with SARS-CoV-2 PCR

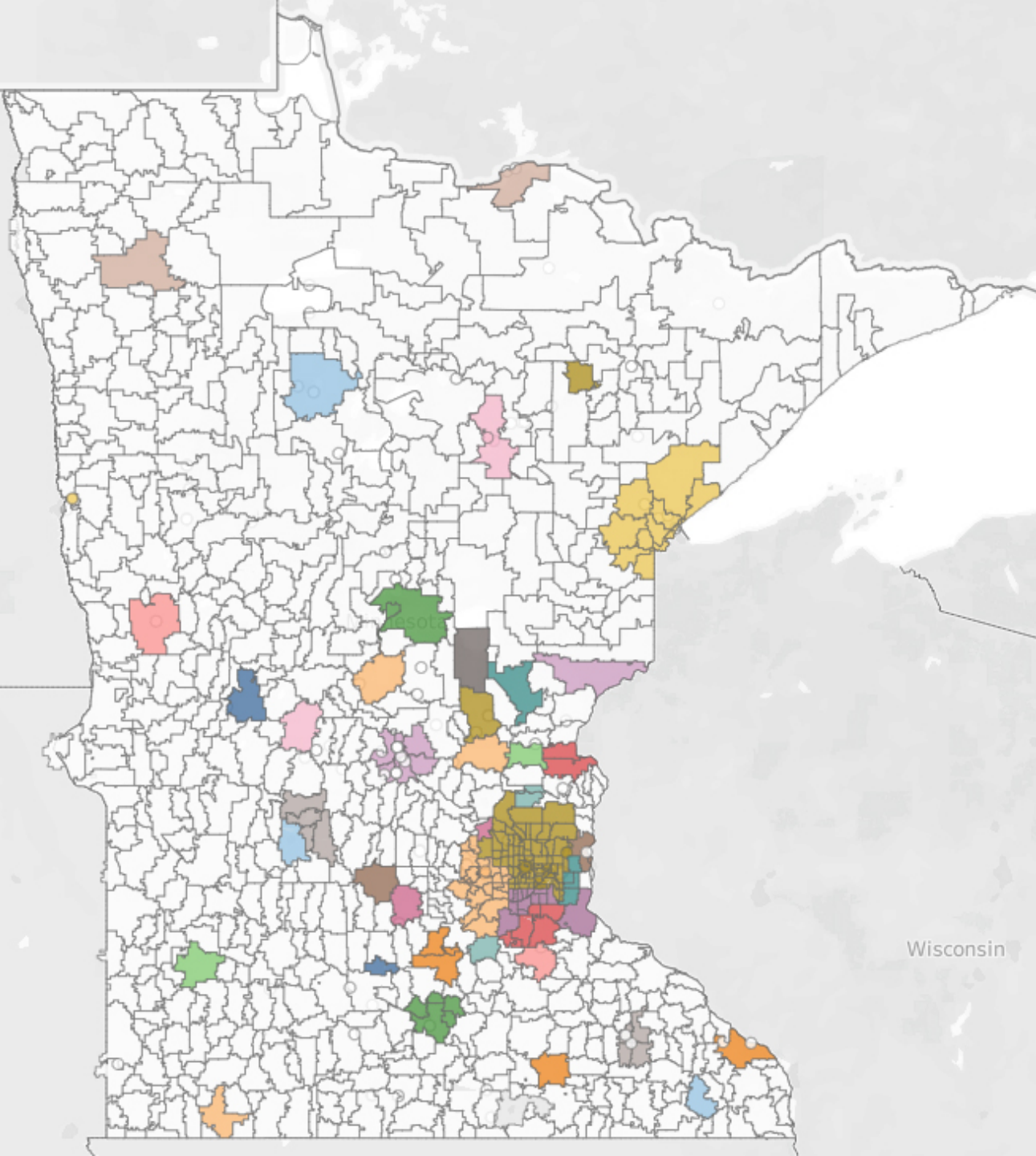


Glenn Simmons, PhD



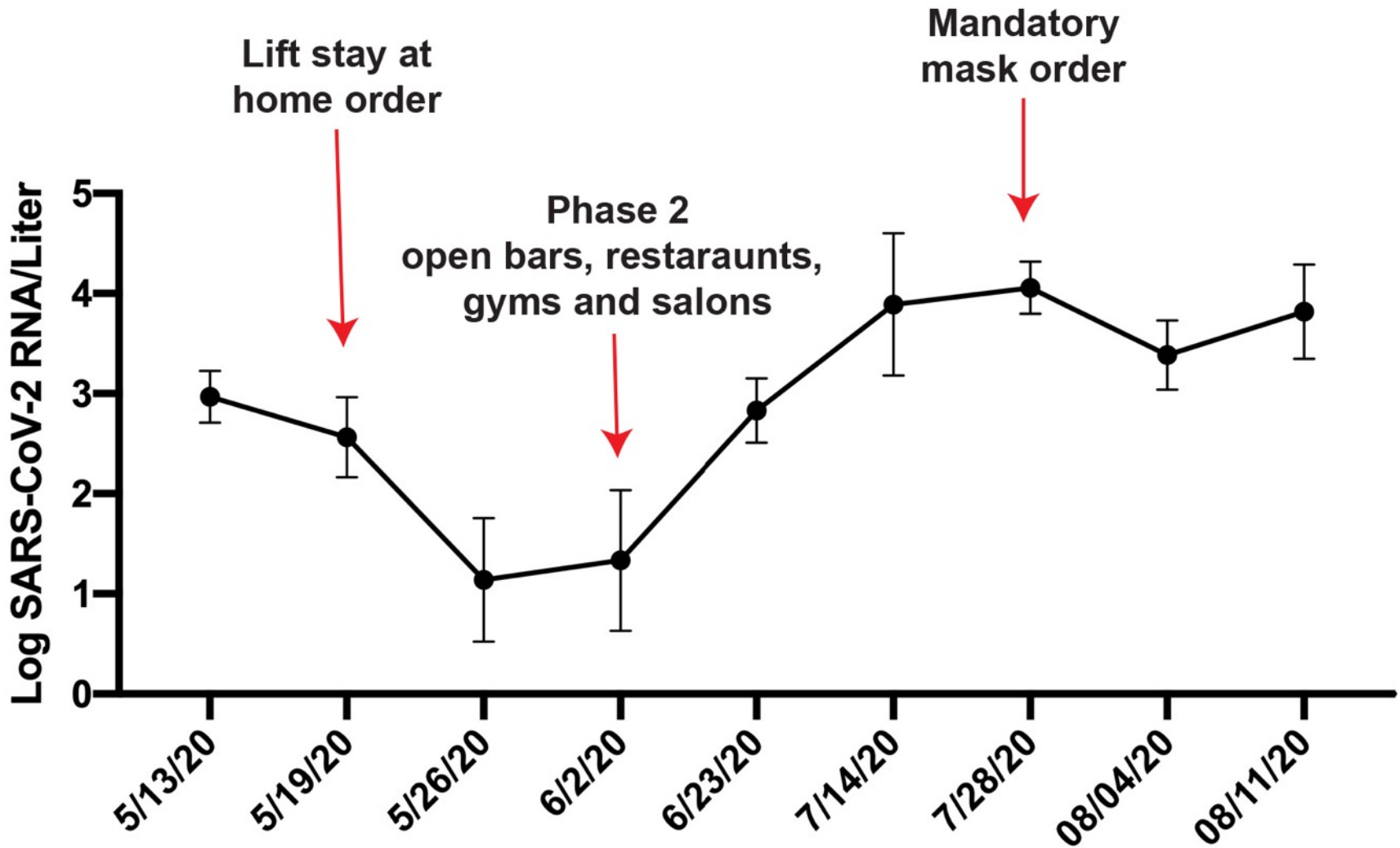
Richard Melvin, PhD



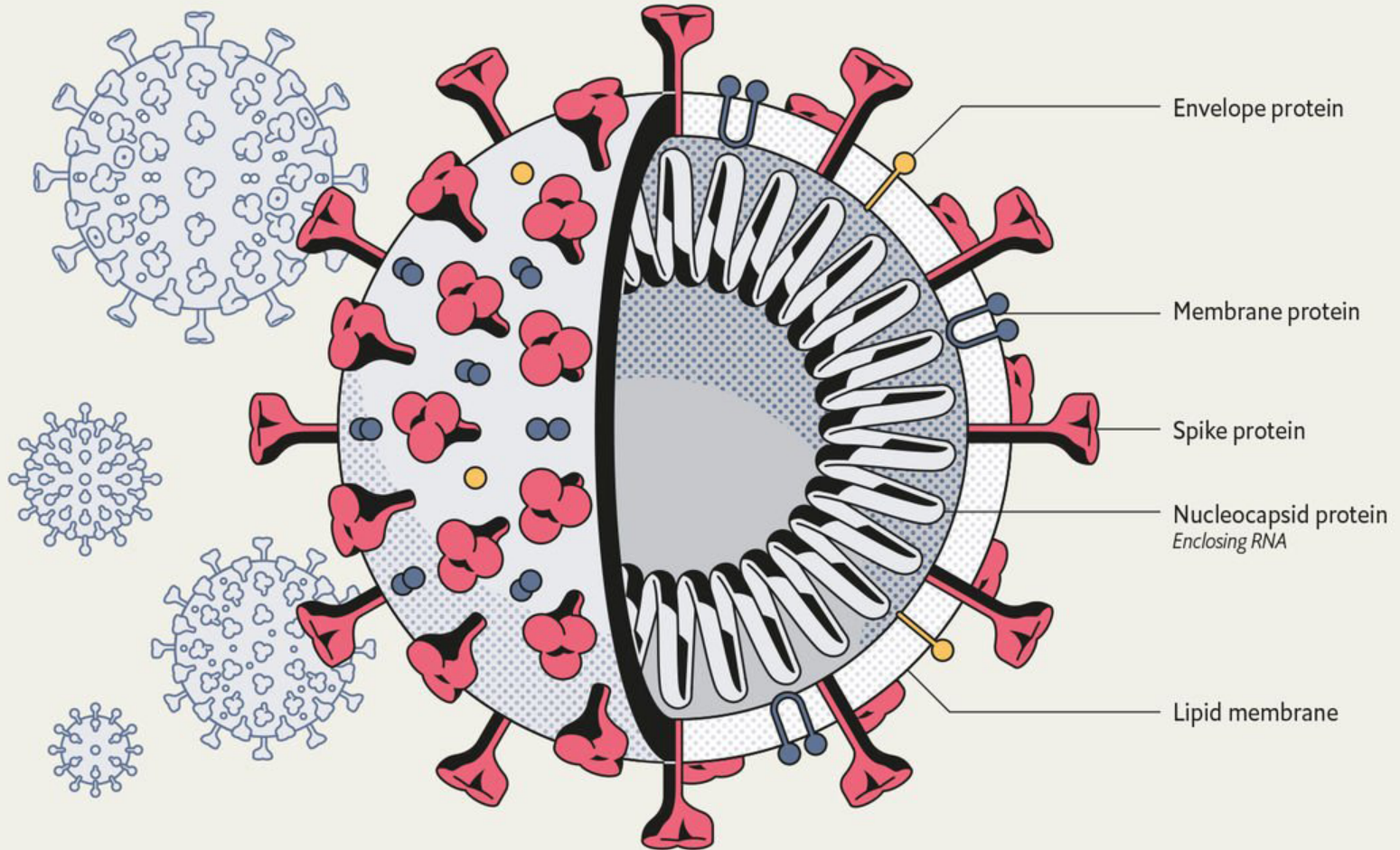


Wisconsin

# Composite analysis of wastewater analysis in cities <100,000 people in Minnesota



# The Quest for a Vaccine





# Types of Vaccines

Protein  
(subunit)

Hepatitis B, Pneumovax

Inactivated  
(killed)

Hepatitis A, Rabies

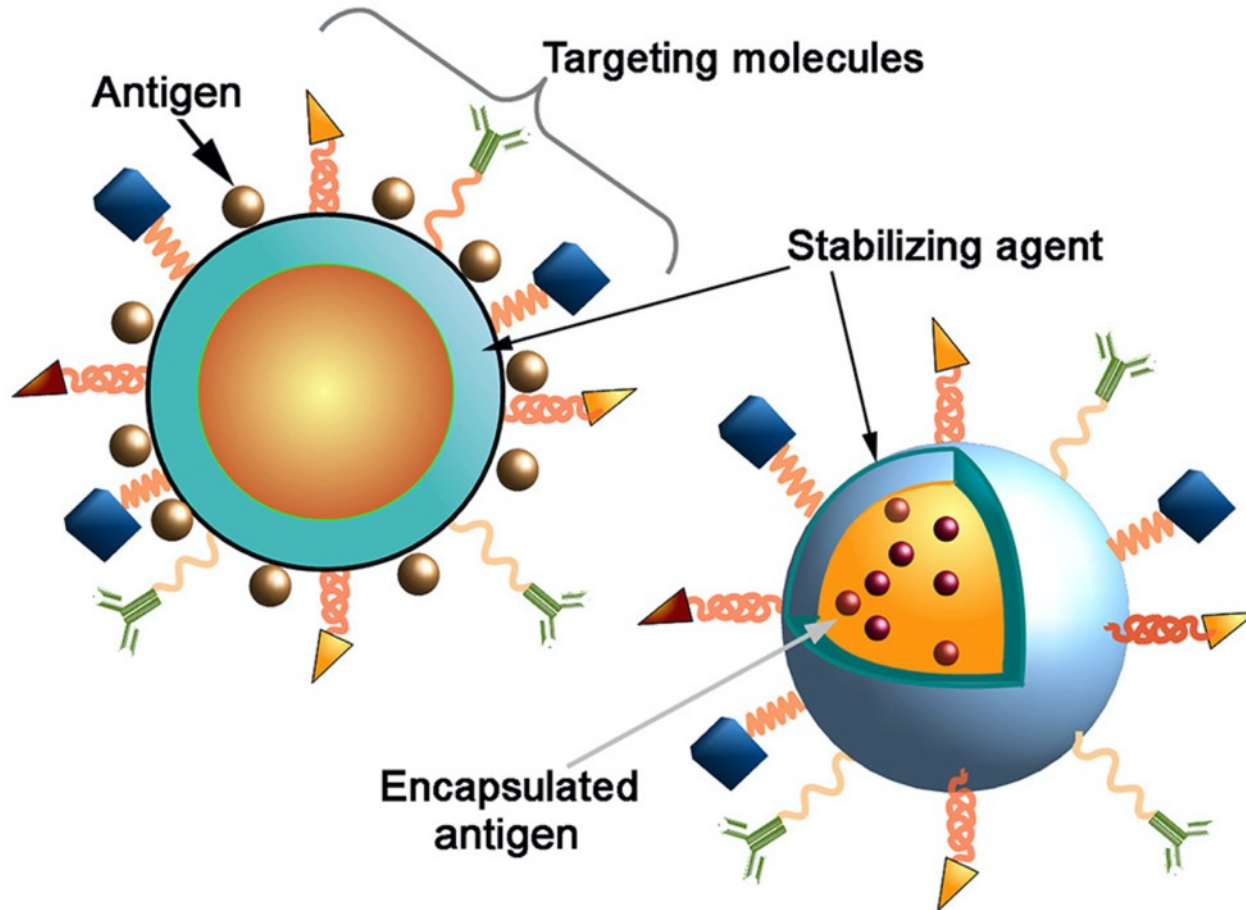
Nanoparticle  
(e.g., Novavax)

mRNA  
(e.g., Moderna)

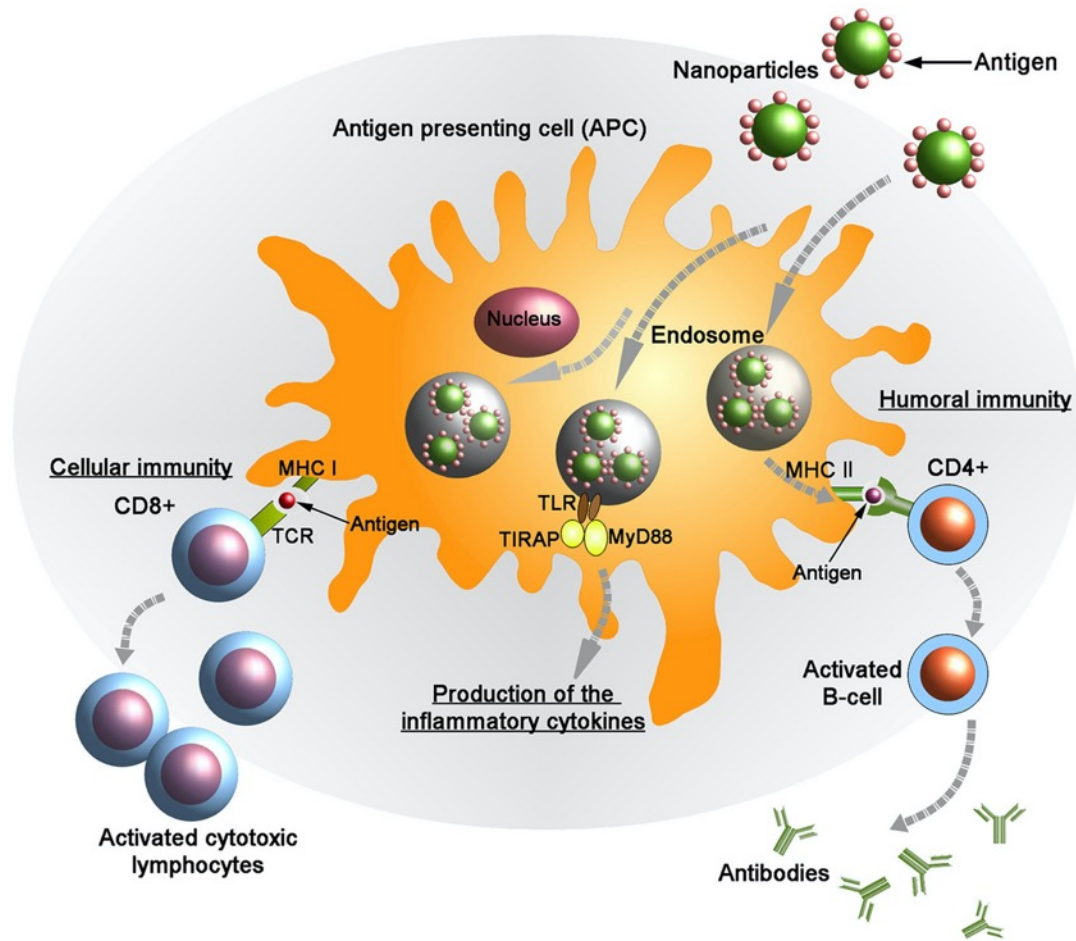
Attenuated  
(Live virus)

MMR, Yellow Fever

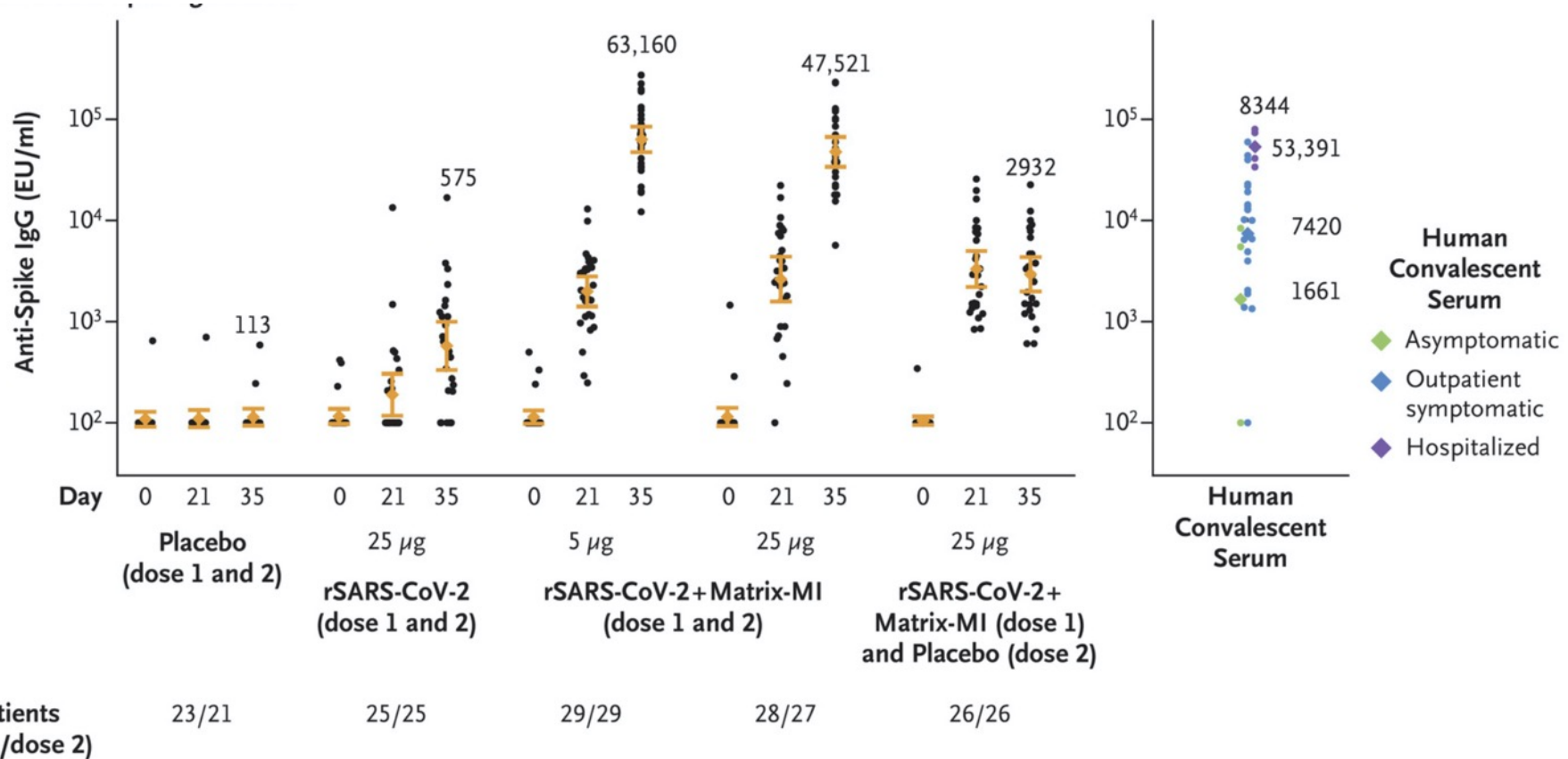
# Nanoparticle Vaccines



# Nanoparticle Vaccines



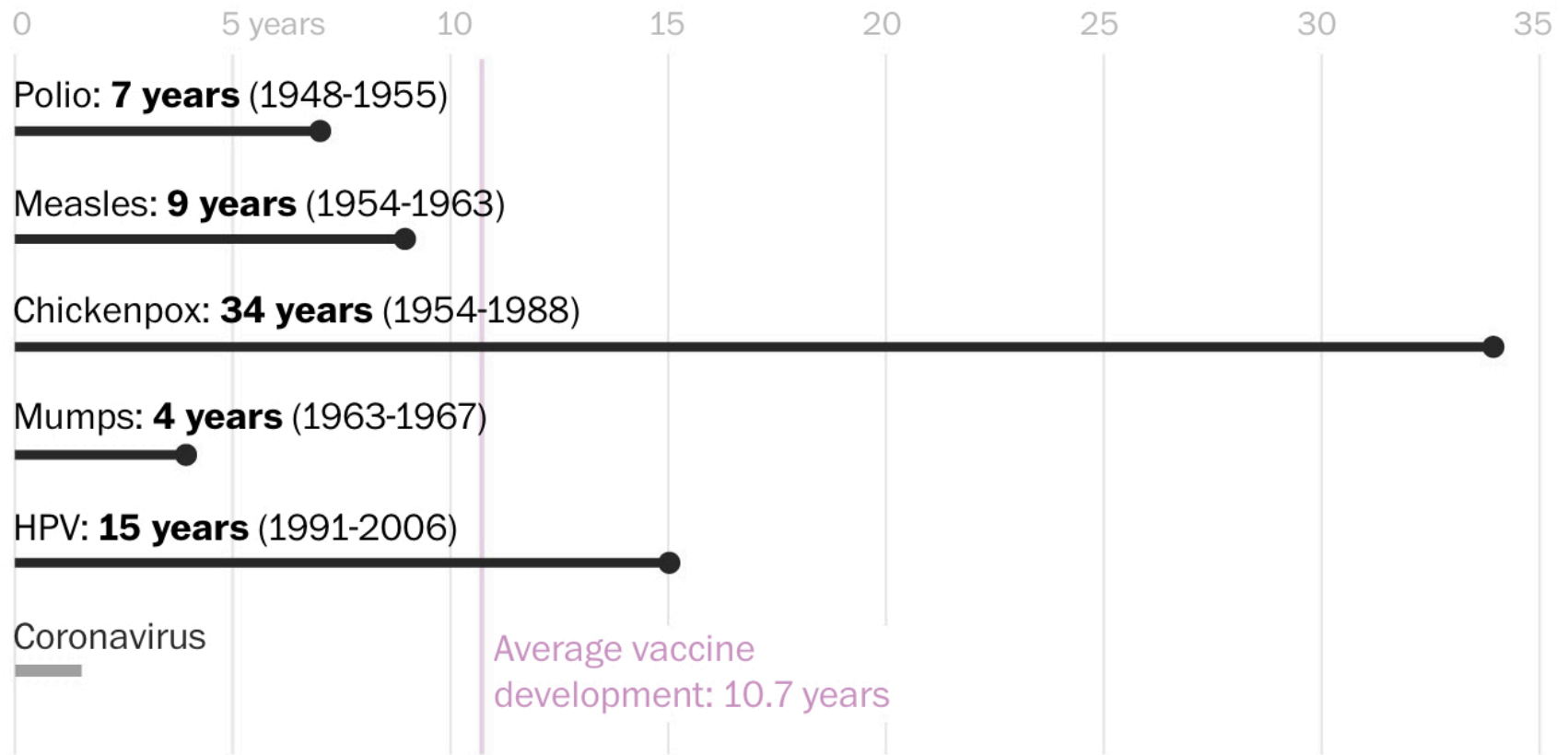
# Immunogenicity of the Nanoparticle Vaccine by Novavax





# In 300 days we went from a published sequence to > 90,000 people on phase 3 vaccine trials

## How long it took to develop other notable vaccines



# Wear Your Mask



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## Disease Prevention



**Maintain social distancing**

Source: WHO



# Get the Vaccine When It Is Available





# Questions?

