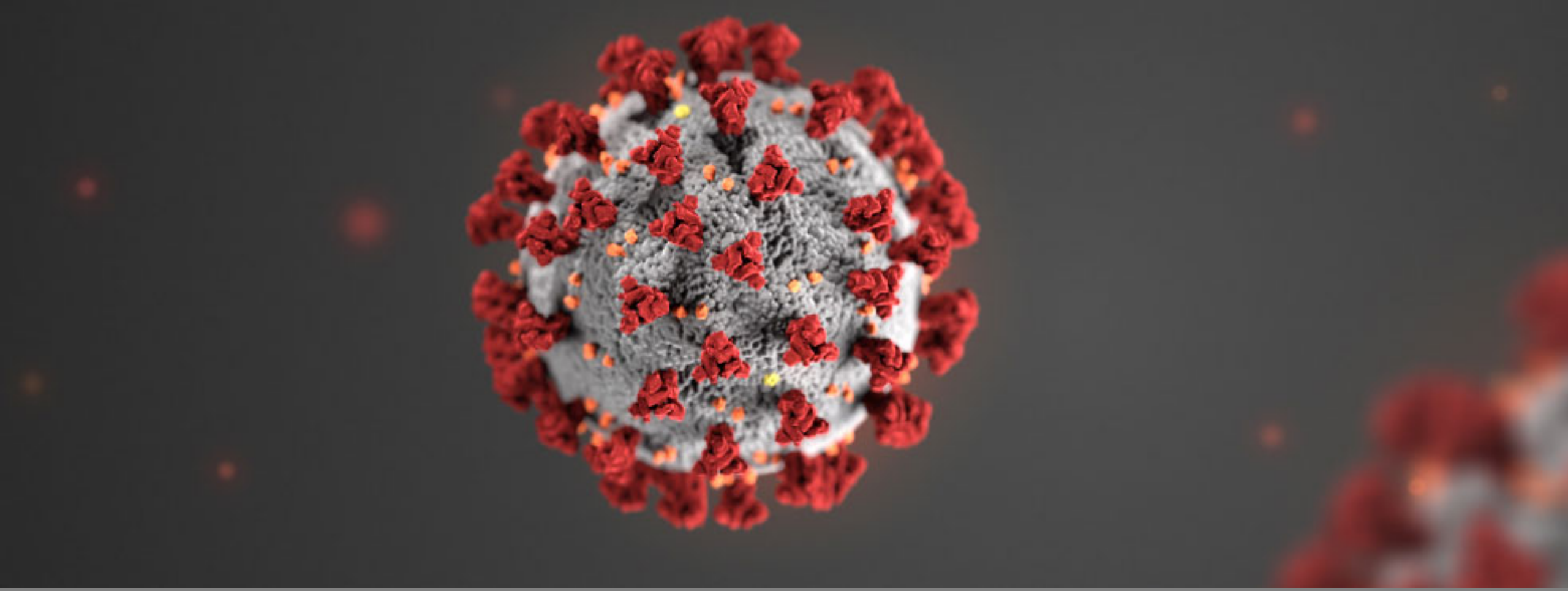


Maine EMS Pandemic Response | Vaccine Information

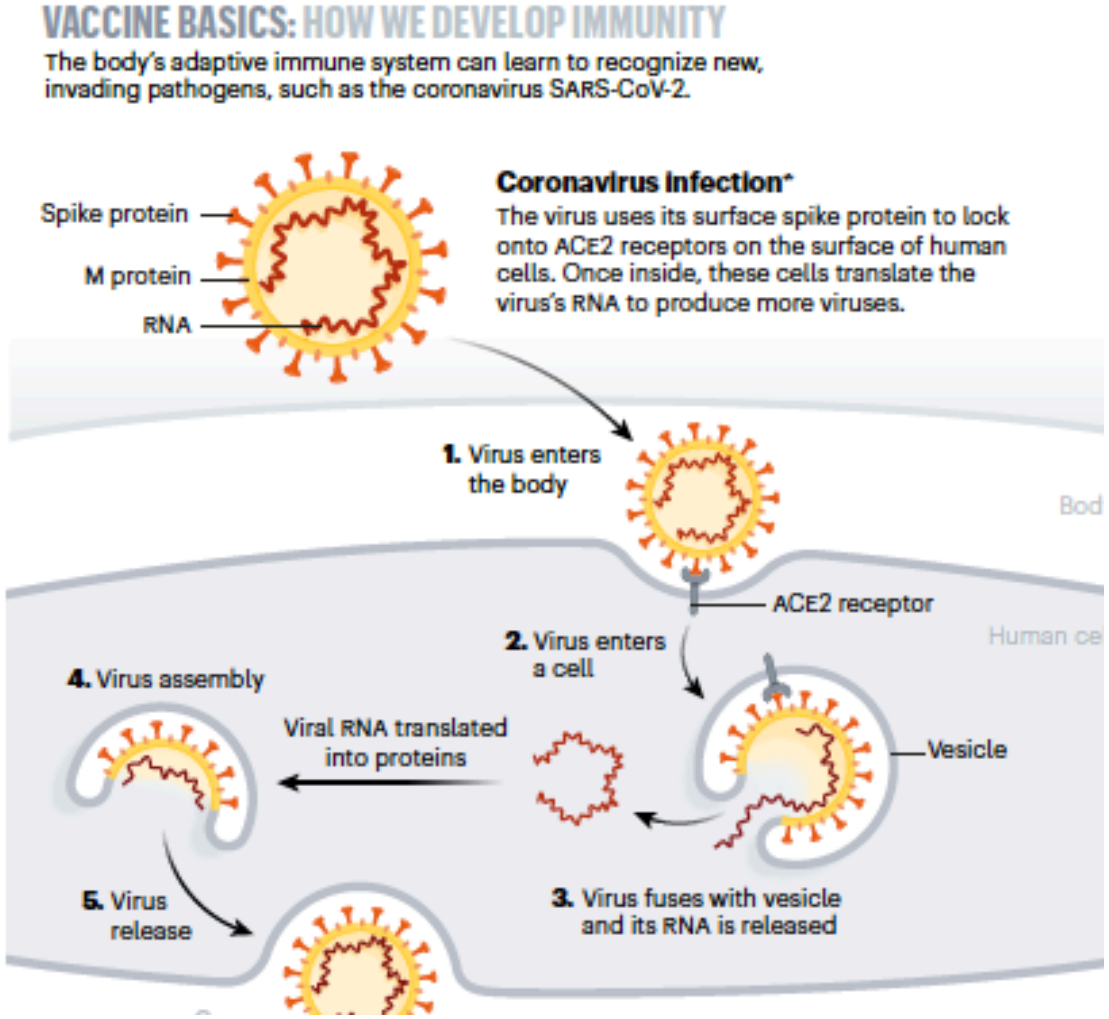
MAINE EMS

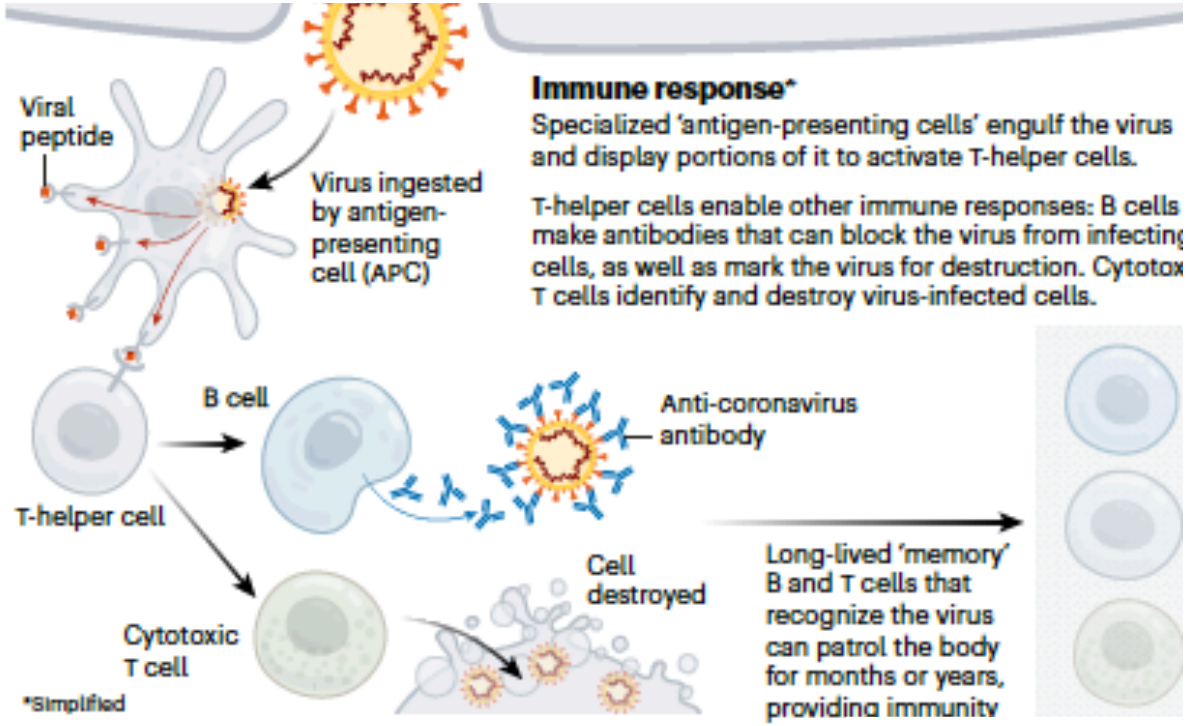
Goals and Objectives

- Background
- How humans develop immunity
- Vaccine technology and how this vaccine works
  - Information regarding mRNA technology used in the first two COVID-19 vaccinations
- General information about COVID-19 vaccine development and approval
- Safety of the first two COVID-19 vaccines
- Efficacy of the first two COVID-19 vaccines

Goals and Objectives

How humans develop immunity





Source: Nature Vol 580

COVID-19 Vaccine Technology and Mechanism of Action

Types of coronavirus vaccine approaches

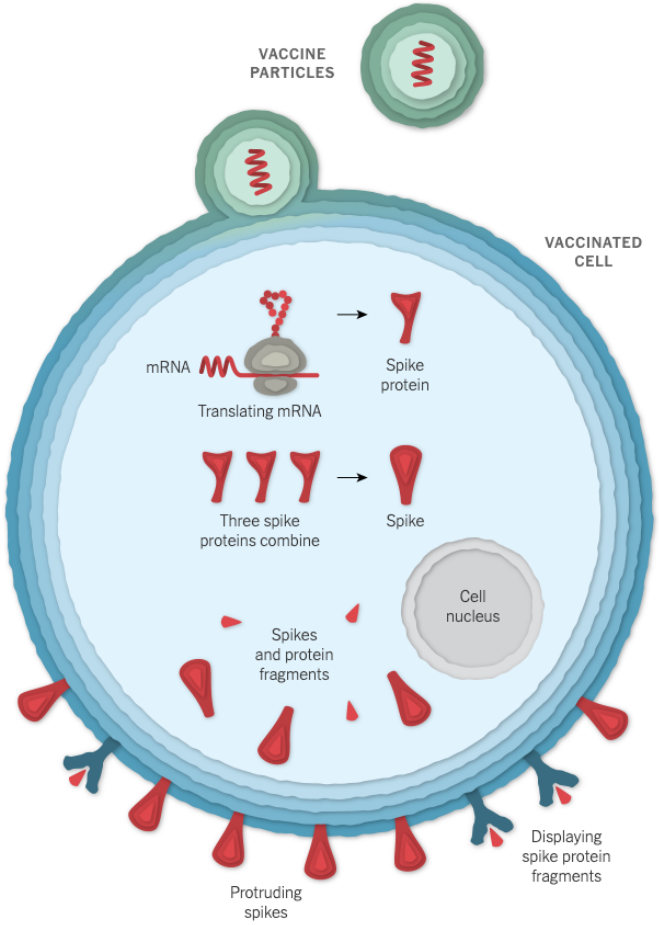
Scientists are casting a wide net to see what works best against the novel coronavirus.

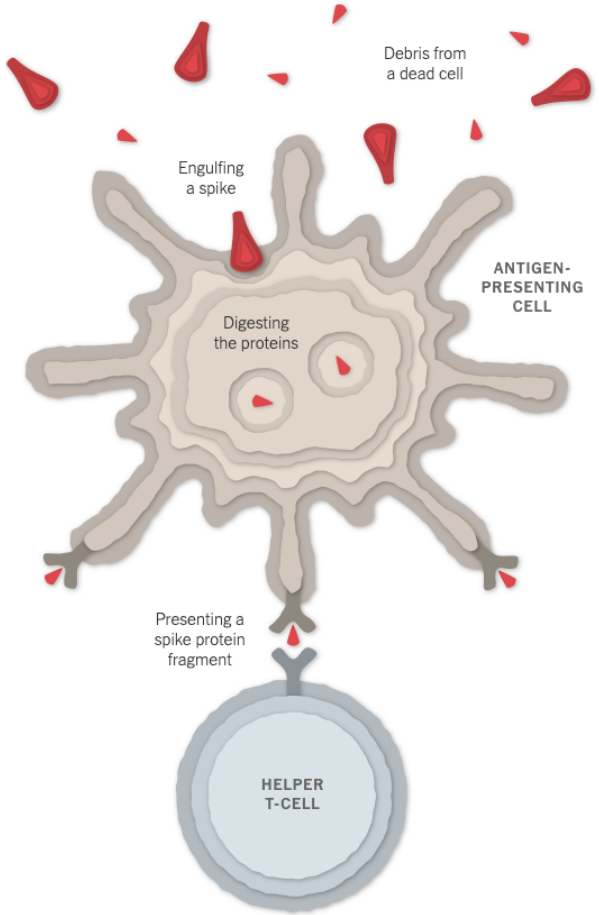
Types of vaccines	DNA and RNA	Live attenuated	Inactivated	Subunit	Viral vector
					
How it works	This vaccine uses DNA or RNA molecules to teach the immune system to target key viral proteins.	This is a weakened version of the actual virus.	An inactivated vaccine uses the whole virus after it has been killed with heat or chemicals.	This vaccine uses a piece of a virus' surface to focus your immune system on a single target.	This approach takes a harmless virus and uses it to deliver viral genes to build immunity.
Advantages	Easy and quick to design.	Stimulates a robust immune response without causing serious disease.	Safe because the virus is already dead and is easy to make.	Focuses the immune response on the most important part of the virus for protection and cannot cause infection.	Live viruses tend to elicit stronger immune responses than dead viruses or subunit vaccines.
Disadvantages	Never been done before. There are no licensed DNA or RNA vaccines currently in use.	May not be safe for those with compromised immune systems.	Not as effective as a live virus. Some previous inactivated vaccines have made the disease worse; safety for the novel coronavirus needs to be shown in clinical trials.	May not stimulate a strong response, other chemicals may need to be added to boost long-term immunity.	Important to pick a viral vector that is truly safe. An immune response to the viral vector could make the vaccine less effective.
Existing examples	• None	• Measles, Mumps and Rubella • Chickenpox	• Polio	• Pertussis • Hepatitis B • Human papillomavirus (HPV)	• Ebola • Veterinary medicine
Group testing this approach for COVID-19	• Moderna (RNA) • Inovio (DNA)	• Codagenix • Indian Immunologicals Ltd.	• Sinovac • Sinopharm	• Novavax • AdaptVac	• University of Oxford & AstraZeneca • CanSino Biologics • Johnson & Johnson

Sources: CDC; NIAID; FDA

MICHELLE GUERRERO and JONATHAN WOSEN U-T

Source: San Diego Union Tribune



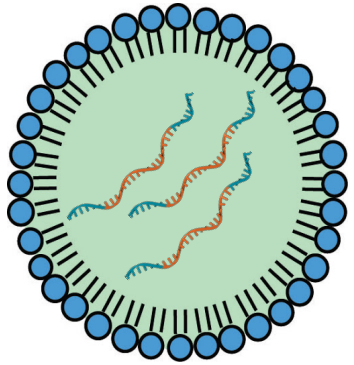


How these vaccines work

Image Source: New York Times 12/9/2020

What is in these vaccines:

- mRNA
  - Messenger RNA for the SARS-COV2 spike protein
- Lipid nanoparticle
  - Envelopes and stabilizes the mRNA
- Buffer
  - Lipids, cholesterol, polyethylene glycol, potassium products, sucrose



What is <u>not</u> in these vaccines:

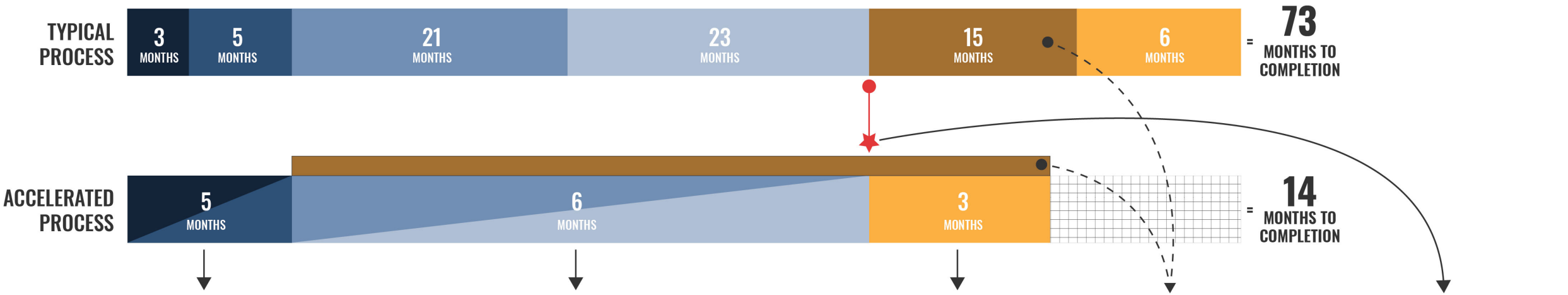
- No live or attenuated virus
- No DNA
- No preservatives
- No human or animal cells

OPERATION WARP SPEED
ACCELERATED VACCINE PROCESS

MISSION: Deliver 300 million doses of safe and effective vaccine by 1 January 2021.

Questions we have been asked:

- Were safety protocols skipped?
- ‘Warp Speed’ -or- ‘Ludicrous Speed’?



1

A typical 8-month process is accelerated by:

- Creating vaccine candidates immediately after viral genome sequence is available.
- Using vaccine platforms developed for other diseases.

2

A typical 42-month process is accelerated by:

- Large scale Phase III clinical trials of 30,000 volunteers allowing for rapid collection and earlier analysis of safety and efficacy data of demographically diverse populations by the FDA, reducing the typical 12-month approval process to three months.
- Two promising candidates began Phase III clinical trials in July, with others to follow quickly in coming months. Before beginning Phase III, candidates must show safety data from animal and human studies.
- The U.S. Government funding at-risk, large-scale manufacturing of the most promising vaccine candidates during Phase III clinical trials to ensure any vaccine proven to be safe and effective is available immediately upon FDA Emergency Use Authorization (EUA) approval or licensure.

4

A typical 6-month process is accelerated by:

- A tiered approach based on CDC recommended allocation methodology used as part of pandemic flu planning and the COVID-19 response will be used to determine vaccine distribution.

3

A typical 15-month process is accelerated by:

- Planning for infrastructure and distribution before the vaccines are approved or authorized.
- CDC leading distribution planning with DoD augmentation.

5

A typical 12-month FDA review for EUA approval or licensure is accelerated by:

- Providing continuous safety and efficacy data collected in large Phase III clinical trials.

R&D + Preclinical Trials Vaccine Candidate/s Identified
Phase I Clinical Trials
Phase II Clinical Trials
Phase III Clinical Trials
Manufacturing
Distribution

OPERATION WARP SPEED
ACCELERATED VACCINE PROCESS

MISSION: Deliver 300 million doses of safe and effective vaccine by 1 January 2021.

Source: Dept of Defense Operation Warp Speed

Will I be required to get this vaccine?

- No, vaccination is not mandatory
- The decision is up to the potential recipient

Is it possible to contract SARS-COV2 from the vaccine?

- No
- The current vaccines train your immune system to respond to a single protein from the virus
- You are not exposed to any live virus

Source: CDC Facts about COVID-19 Vaccines

Is it possible to test positive for COVID after vaccination?

- No
- The current vaccines train your immune system to respond to a single protein from the virus by introducing the mRNA that encodes for that protein
- You are not exposed to the whole virus or viral DNA. PCR tests will not detect the vaccine mRNA or spike proteins it produces

I already had COVID… should I get vaccinated?

#1

#2

- Yes
- While recovery from COVID portends some immunity against repeat illness, that immunity starts to wane after 60-90 days[1]
- Current CDC guidance suggests it is reasonable to wait 90 days after illness prior to vaccination[2]

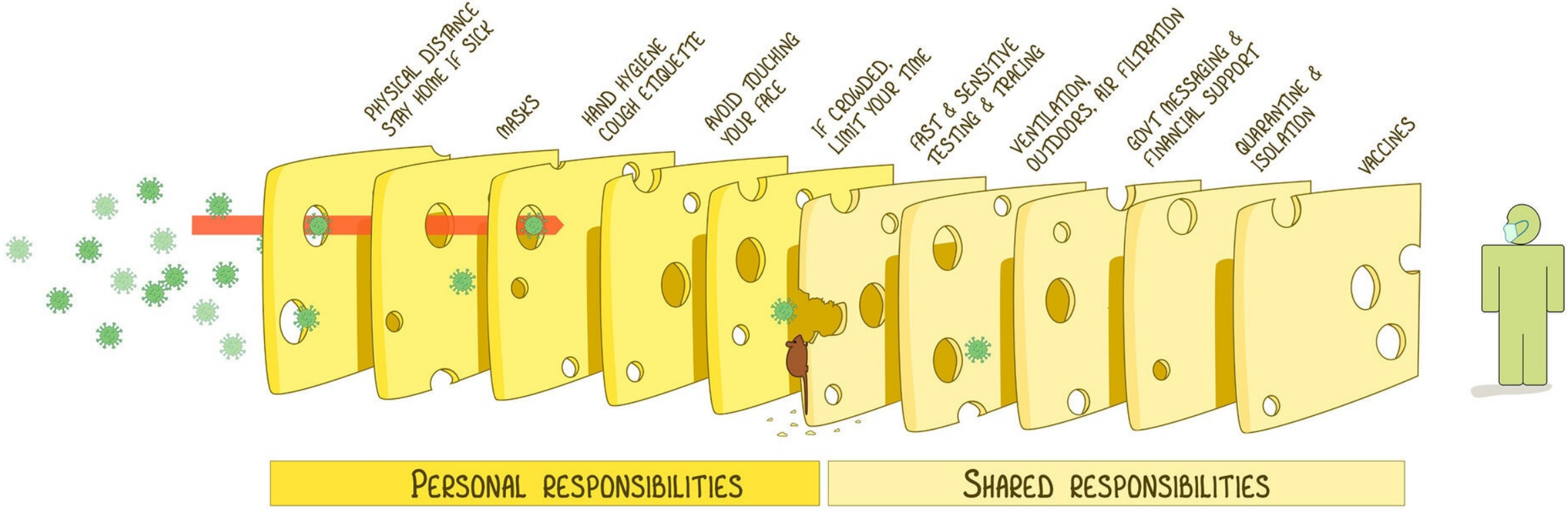
Source:
1) CDC MMWR Nov 27, 2020; 69(47);1762-1776
2) CDC Interim Clinical Guidance for Use of Pfizer-BioNTech COVID-19 Vaccine. 12/14/2020

If I get vaccinated, when can I decrease my PPE or public masking?

- Vaccines are not 100% effective and you may still contract COVID if exposed
- Public masking and appropriate PPE during patient interactions will remain essential for complete protection
- Will be determined based on rate of positive tests, incidence of new infections in the population
- We will all get there together!

The Swiss Cheese Respiratory Virus Pandemic Defence

Recognising that no single intervention is perfect at preventing spread



Each intervention (layer) has imperfections (holes).
Multiple layers improve success.

Ian M Mackay
virologydownunder.com
With thanks to Jody Lanard, Katherine Arden & the Uni of Qld
Based on the Swiss cheese model of accident causation, by James T Reason, 1990
version 3.0
update: 24oct2020

Can I still infect others?

- We don’t know
- We do not yet know whether vaccines will prevent you from being an asymptomatic carrier
- Public masking and appropriate PPE during patient interactions will protect you and your loved ones

Should I get vaccinated if I am pregnant, lactating, or may become pregnant?

- Maybe
- Pregnancy is known to be a high-risk condition that can lead to severe COVID-19 illness
- Pregnant women were not included in the Phase I trials
  - A small number of women became pregnant or were found to be pregnant in Phase II and III trials
- Please have this conversation with your OB

Source: American College of Obstetricians and Gynecologists Practice Advisory 12/2020

Can I defer vaccination? Will I be able to get the vaccine later?

- Yes, you can defer
- The decision is yours
- You are being prioritized for early vaccination right now. Your “space in line” in the future is uncertain

Are these vaccines safe?

- Yes they are safe
- You will likely have a mild reaction
  - This is your immune system working

Moderna - Phase I

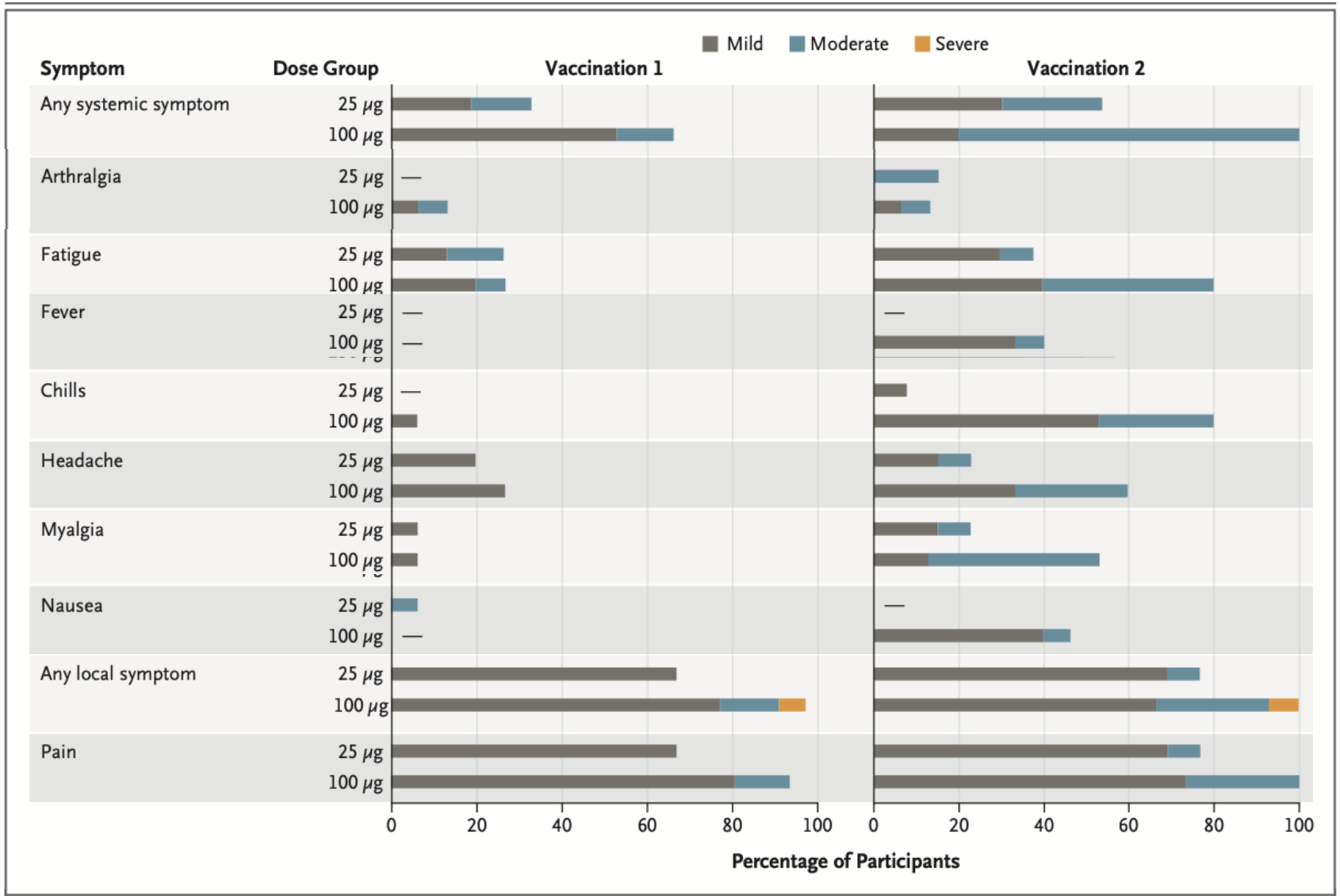


Figure 1. Systemic and Local Adverse Events.

The severity of solicited adverse events was graded as mild, moderate, or severe (see Table S1).

Source: Jackson et al. NEJM 2020; 383:1920-31

Cases of Anaphylaxis reported to the Vaccine Adverse Event Reporting Vaccine and reported out weekly

CDC MMWR Data for week of December 14-23, 2020: 21 cases after administration of > 1.8 million first doses (Pfizer)

ALLERGIES			
	ALLERGIES • History of food, pet, insect, venom, environmental, latex, or other allergies not related to vaccines or injectable therapies • History of allergy to oral medications (including the oral equivalent of an injectable medication) • Non-serious allergy to vaccines or other injectables (e.g., no anaphylaxis) • Family history of anaphylaxis • Any other history of anaphylaxis that is not related to a vaccine or injectable therapy **ACTIONS** • 30 minute observation period: Persons with a history of severe allergic reaction (e.g., anaphylaxis) due to any cause • 15 minute observation period: Persons with allergic reaction, but not anaphylaxis	**ALLERGIES** • History of severe allergic reaction (e.g., anaphylaxis) to another vaccine (not including Pfizer-BioNTech vaccine) • History of severe allergic reaction (e.g., anaphylaxis) to an injectable therapy **ACTIONS:** • Risk assessment • Potential deferral of vaccination • 30 minute observation period if vaccinated	**ALLERGIES** • History of severe allergic reaction (e.g., anaphylaxis) to any component of the Pfizer-BioNTech vaccine **ACTIONS** • Do not vaccinate

* See Special Populations section for information on patient counseling in these groups

Source: CDC Interim Clinical Guidance for Use of Pfizer-BioNTech COVID-19 Vaccine. 12/14/2020

Are these vaccines effective?

- Yes
- Vaccination reduces the rate of contracting COVID

	Vaccinated	Placebo
COVID	19	347

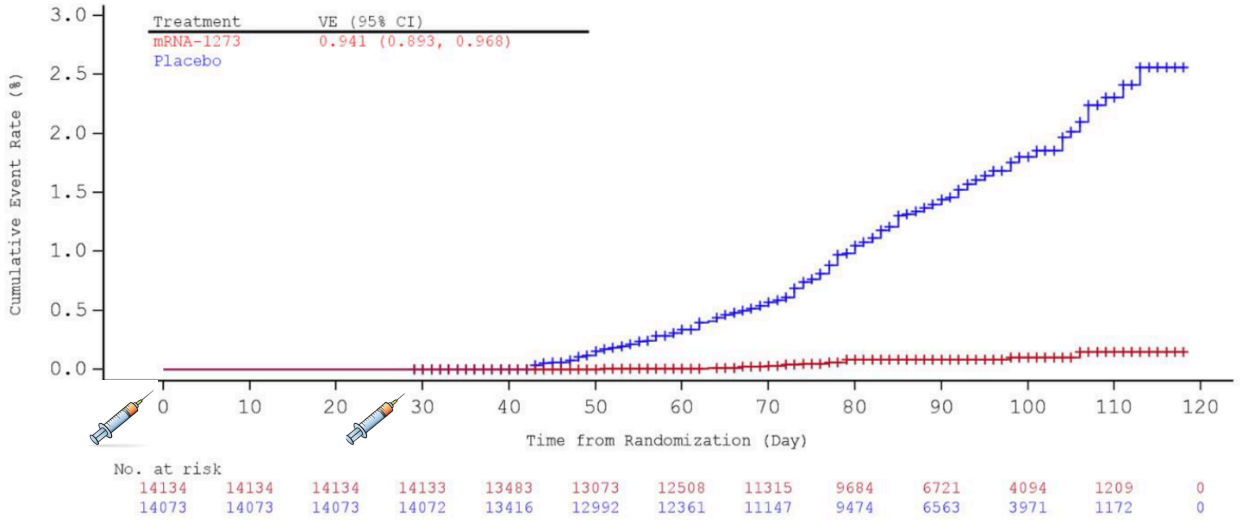
- Vaccination reduces the rate of contracting severe COVID

	Vaccinated	Placebo
Severe COVID	1	39

Source: Combined total data from FDA EUA briefing documents for Moderna and Pfizer vaccines

Moderna

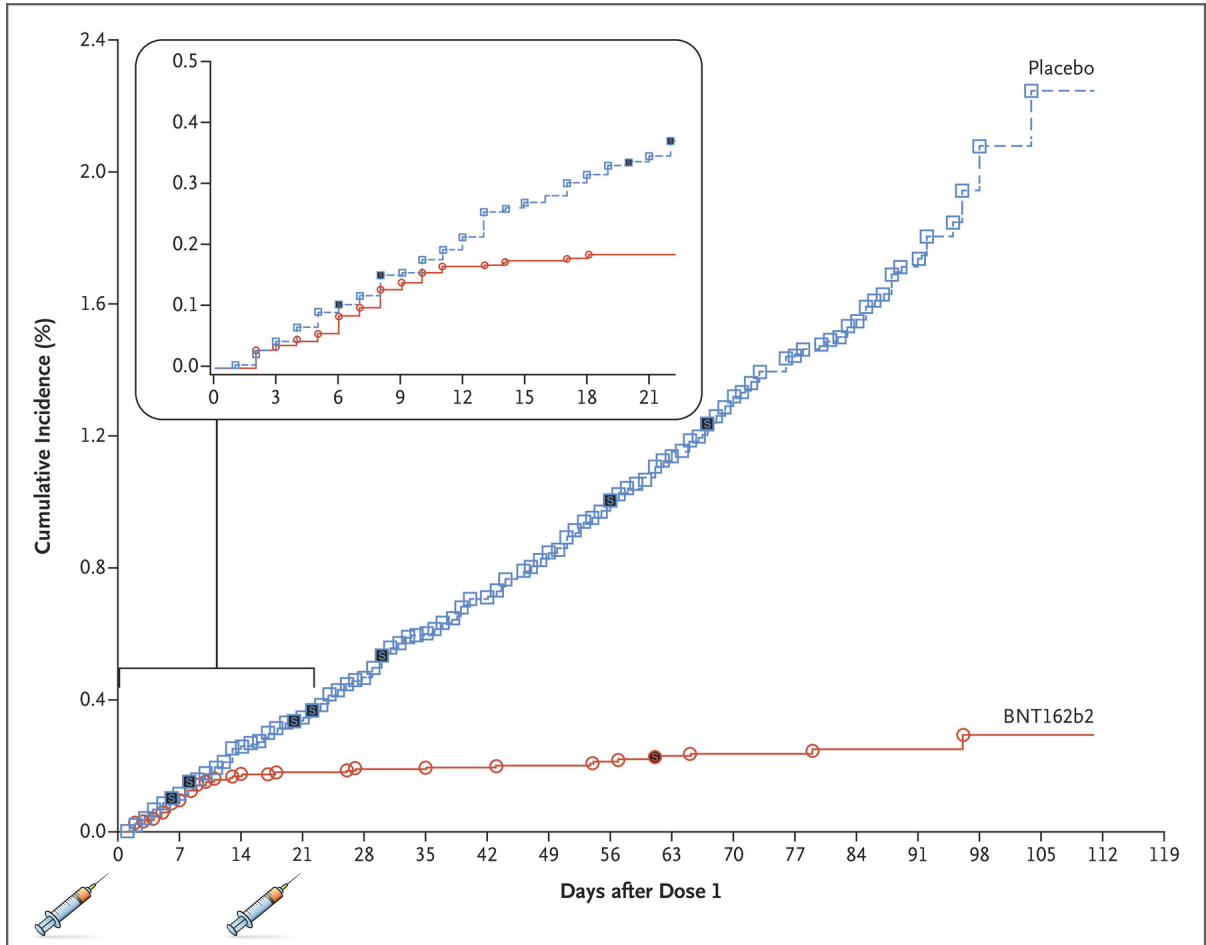
Figure 6: Interim Dataset – Cumulative Incidence Rate of Time to First Occurrence of COVID-19 Starting 14 Days After Second Injection in Study 301 (Per-Protocol Set; Nov 25 Dataset[a])



[a] Primary efficacy analysis
Note: Vaccine efficacy is defined as 1 – hazard ratio (mRNA-1273 vs. placebo) and 95% CI was estimated using a stratified Cox proportional hazard model with Efron's method of tie handling and with the treatment group as a covariate, adjusting for stratification factor.

Source: VRBPAC Briefing Document 12/17/2020 meeting

Pfizer



Efficacy End-Point Subgroup	BNT162b2, 30 μg (N=21,669) No. of participants	BNT162b2, 30 μg (N=21,669) Surveillance time *person-yr (no. at risk)*	Placebo (N=21,686) No. of participants	Placebo (N=21,686) Surveillance time *person-yr (no. at risk)*	VE (95% CI) *percent*
Covid-19 occurrence					
After dose 1	50	4.015 (21,314)	275	3.982 (21,258)	82.0 (75.6–86.9)
After dose 1 to before dose 2	39		82		52.4 (29.5–68.4)
Dose 2 to 7 days after dose 2	2		21		90.5 (61.0–98.9)
≥7 Days after dose 2	9		172		94.8 (89.8–97.6)

Source: Polack et al. NEJM, 12/10/2020

What about the B-1-1-7 (UK) strain?

- Viruses replicate in large numbers and somewhat erratically
- Most changes are inconsequential
- This variant shows a change in the spike protein used to enter human cells
- Higher load of virus in nasal passages leading to higher transmissibility — severity of illness unchanged
- A single change in structure does not allow a virus to evade the human immune system entirely
- Early data continues to demonstrate vaccine effectiveness

Resources

- Maine EMS Coronavirus page: www.maine.gov/ems/protocols-resources/coronavirus
- New England Journal of Medicine: www.nejm.org/coronavirus
- CDC Facts about COVID-19 Vaccines: https://www.cdc.gov/coronavirus/2019-ncov/vaccines/vaccine-benefits/facts.html