SARS-CoV2 Vaccines

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The Hope Clinic, Emory Vaccine Center

To address global public health threats by translating basic research discoveries into clinical advances

Community education, engagement, and participation

Training: students, residents, fellows, international investigators

Translational human immunology studies

Clinical trials of vaccines and treatments

www.hopeclinic.emory.edu

404-712-1371

The Hope Clinic Funding

Human Immunology Project Consortium

Cooperative Centers for Human Immunology

Vaccine & Treatment Evaluation Unit

COVID-19 Prevention Network

HIV Prevention Trials Network

HIV Vaccine Trials Network

Emory Center for AIDS Research

Antibacterial Resistance Leadership Group

Vaccine Research Center

Emerging Infections Program

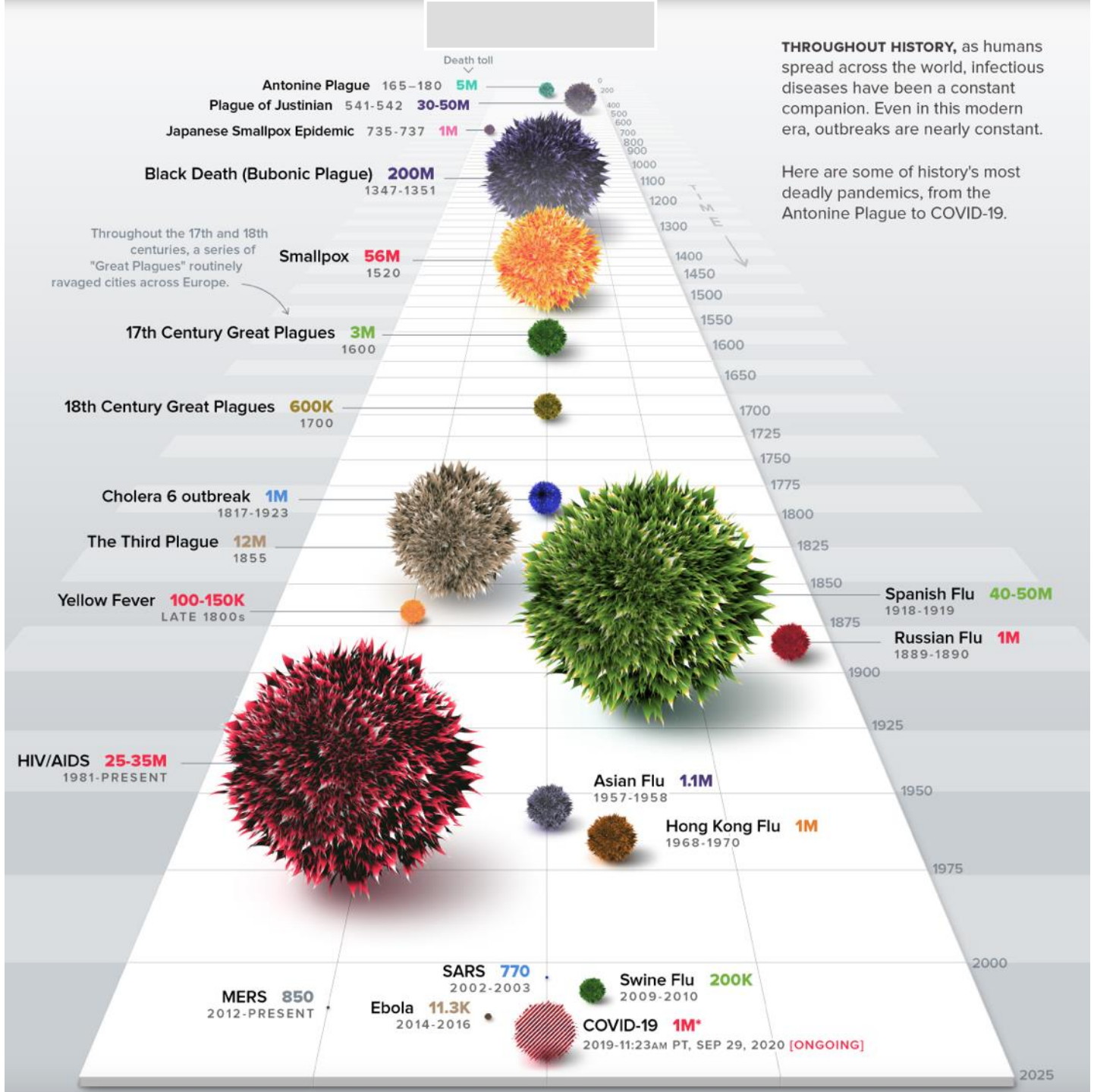
Centers for Diseases Control and Prevention

Conflict of Interest

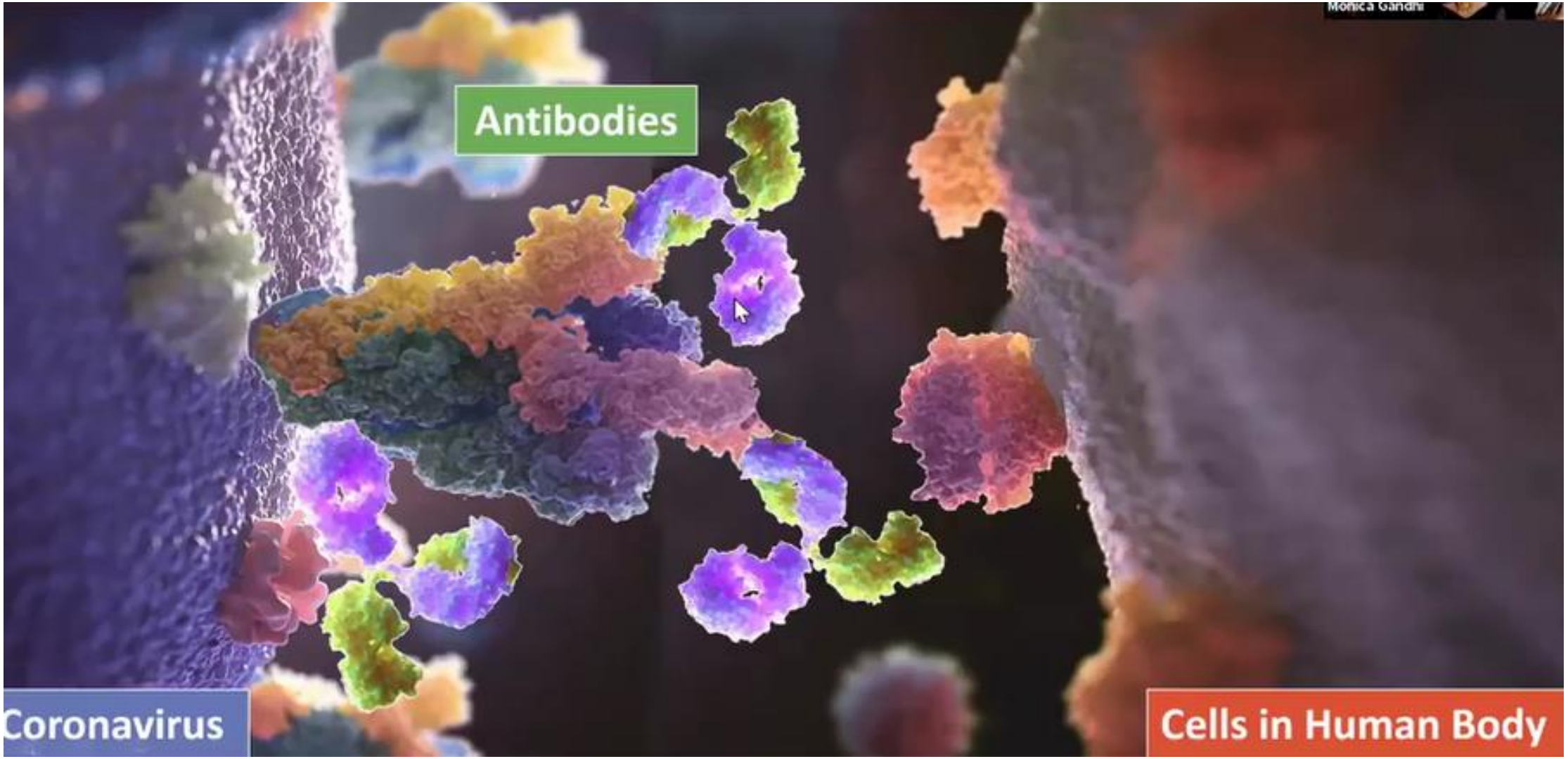
- I receive funds from the following manufacturers to conduct research studies at Emory:
  - Sanofi Pasteur
  - Merck
  - Pfizer
  - Quidel
  - Eli Lilly
- I serve as the Hope Clinic PI for Moderna SARS-CoV-2 phase 1 and 3 vaccine trials and the Emory PI for the Moderna SARS-CoV-2 variant vaccine trial
- I serve as the Emory PI the Gritstone mix and match SARS-CoV-2 vaccine trial
- I serve as the international Chair for the Sanofi Pasteur SARS-CoV-2 Phase 2 and 3 vaccine trials

Not IF, but WHEN

History of Pandemics



The New Plague: What have we learned?


Antibodies
Coronavirus
Cells in Human Body

COVID-19

What are the different kinds of vaccine?

RNA

RNA vaccines work by introducing an mRNA sequence (the molecule which tells cells what to build) to the system which is coded for a specific antigen.

DNA

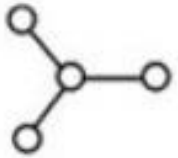
Short for deoxyribonucleic acid, DNA is another of the crucial macromolecules for life. A DNA vaccine involves the direct introduction into appropriate tissues of a plasmid - a doubled-stranded molecule which exists in bacterial cells.

Viral vector

Vaccines use live viruses to carry DNA into human cells.

Virus-like particle

This type of vaccine contains molecules that mimic the virus but are not infectious and, therefore, not a danger. VLP has been an effective way of creating vaccines against diseases such as human papillomavirus (HPV), hepatitis and malaria.



Protein sub-unit

This kind of vaccine uses a part of the virus, in this case the protein component. These vaccines can also be used on almost anyone, including people with weakened immune systems and long-term health problems.

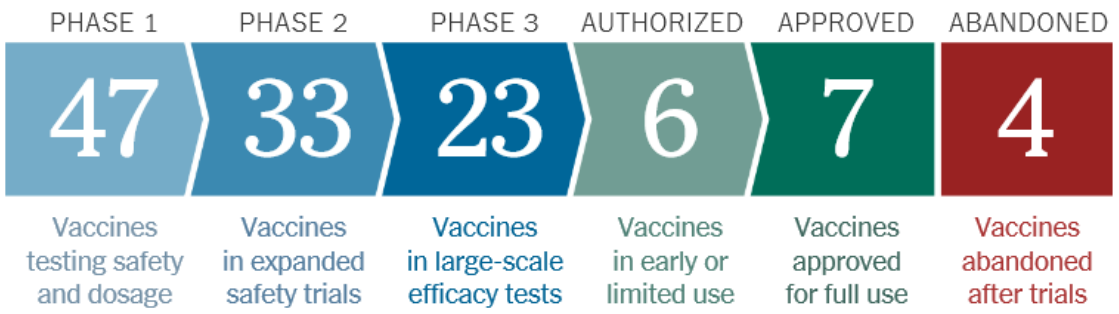
Inactivated virus

These vaccines use the dead version of the virus that causes a disease.

Coronavirus Vaccine Tracker

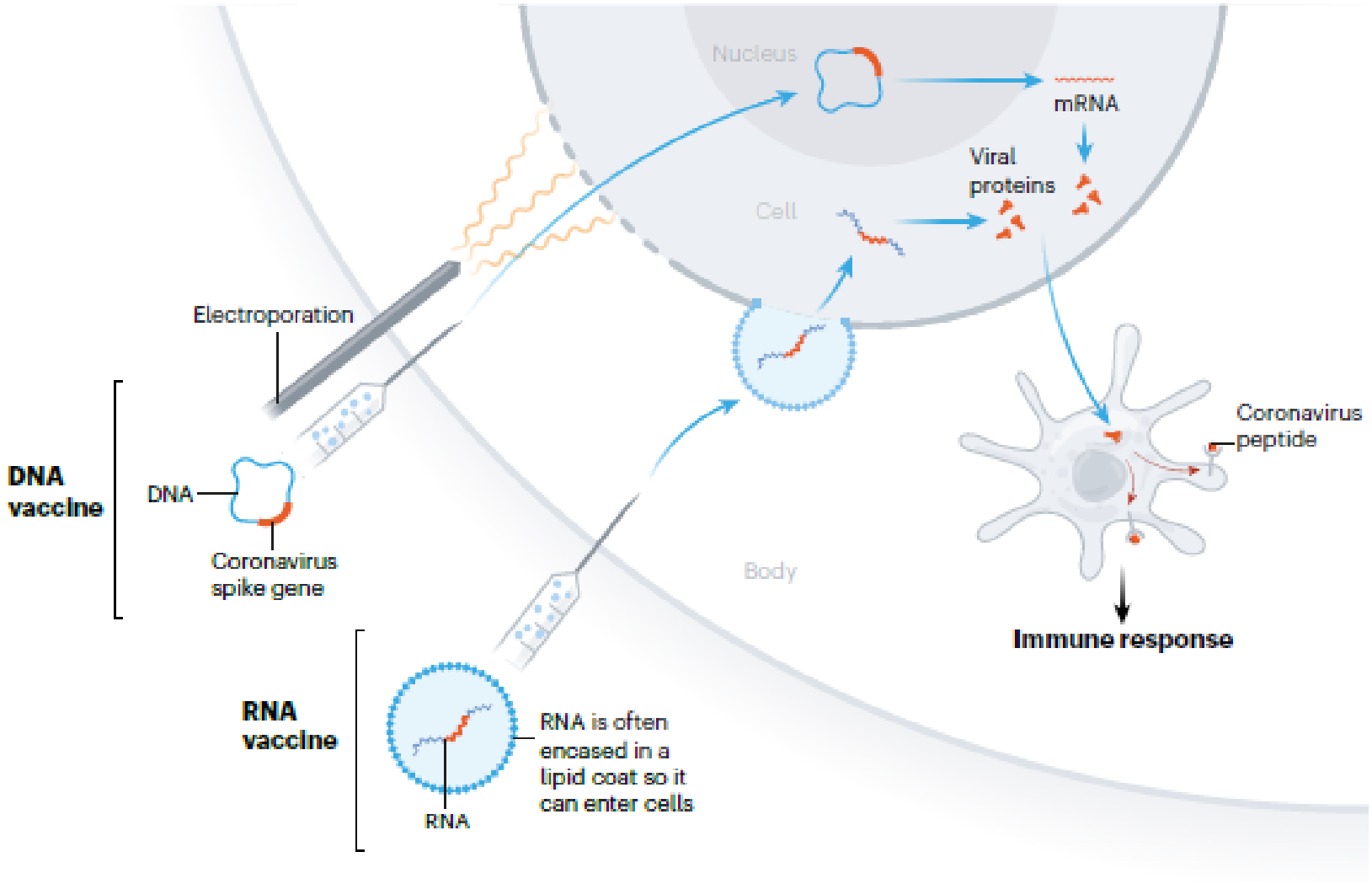
Leading vaccines

Developer	How It Works	Phase	Status
Pfizer-BioNTech	mRNA	2 3	Approved in several countries. Emergency use in U.S., E.U., other countries.
Moderna	mRNA	3	Approved in Switzerland. Emergency use in U.S., U.K., E.U., others.
Gamaleya	Ad26, Ad5	3	Early use in Russia. Emergency use in other countries.
Oxford-AstraZeneca	ChAdOx1	2 3	Approved in Brazil. Emergency use in U.K., E.U., other countries.
CanSino	Ad5	3	Approved in China. Emergency use in Mexico, Pakistan.
Johnson & Johnson	Ad26	3	Emergency use in U.S., E.U., Bahrain.
Vector Institute	Protein	3	Early use in Russia.
Novavax	Protein	3	
Sinopharm	Inactivated	3	Approved in China, U.A.E., Bahrain. Emergency use in other coutries.
Sinovac	Inactivated	3	Approved in China. Emergency use in other countries.
Sinopharm-Wuhan	Inactivated	3	Approved in China. Limited use in U.A.E.
Bharat Biotech	Inactivated	3	Emergency use in India, Iran, Zimbabwe.



Updated March 21, 2021
nytimes.com/vaccinetracker

Nucleic Acid Vaccines



Callaway. Nature, 2020; 580(7805):576-577

mRNA 1273-Phase 1

moderna NIH National Institutes of Health Turning Discovery Into Health

Phase 1 trial overview

Jackson, Anderson, Rouphael et al., NEJM, 2020; 383(20):1920-1931

Protocol Title **Phase I, Open-Label, Dose-Ranging Study of the Safety and Immunogenicity of 2019-nCoV Vaccine (mRNA-1273) in Healthy Adults**

Population 45 adults (18-55 years [mean 33]- 89% White)

Study Groups

Dosage (D0, D28)	ELISA (RBD) D57	Live Virus PRNT (80) D43	CD4 response D43	CD8 response D43
25 mcg	184,000	340	Th1>>>Th2	---
100 mcg	371,000	654	Th1>>>Th2	minimal
250 mcg	582,000	ND	ND	ND
Convalescent	38,000	158	ND	ND

Tolerability Most common: fatigue, chills, headache, myalgia, and pain at the injection site

Safety More systemic reactogenicity after second dose.
The group that received 250 mcg dose had three severe adverse events.

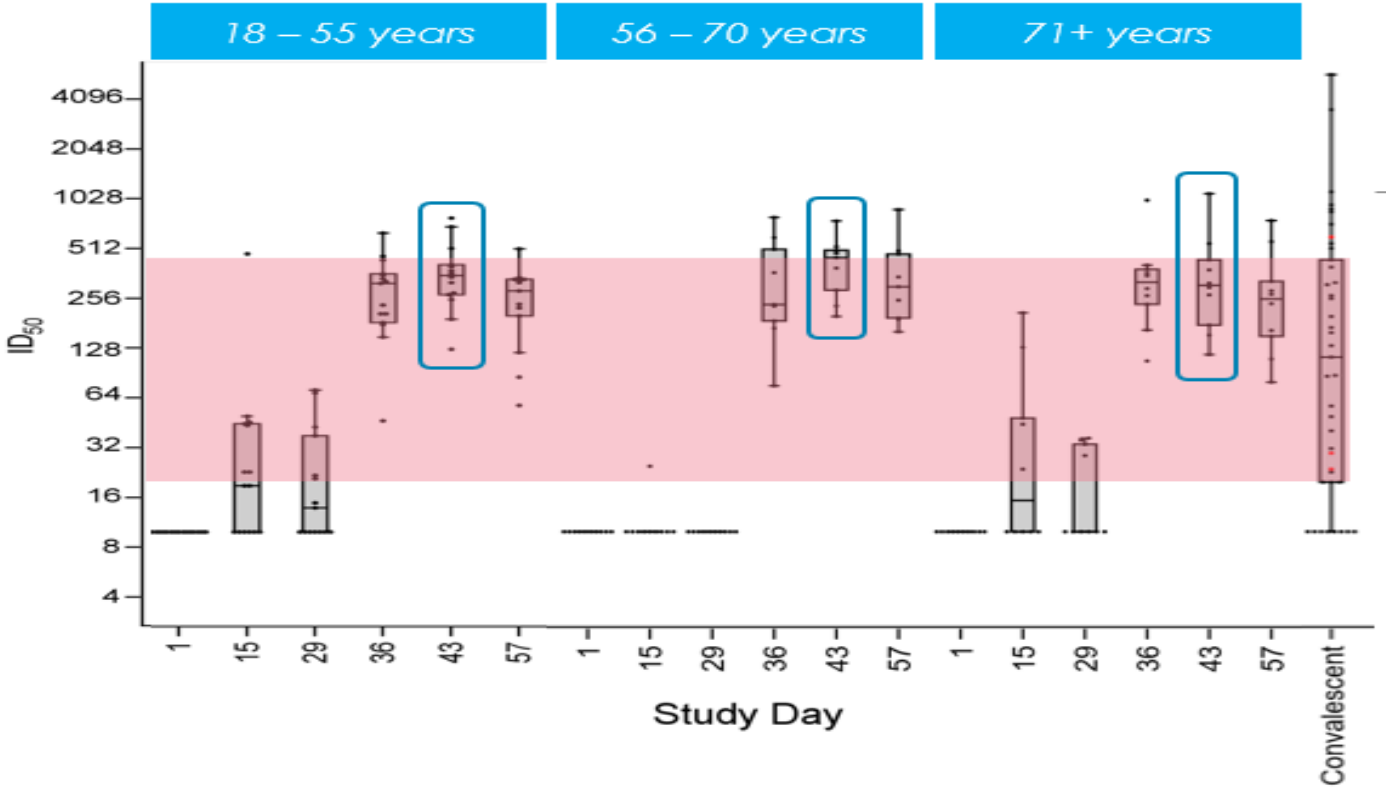
mRNA 1273-Phase 1

moderna

NIH National Institutes of Health
Turning Discovery Into Health

Anderson, Rouphael et al., NEJM, 2020; 383(25):2427-2438

Pseudovirus neutralization assay titers (ID50)

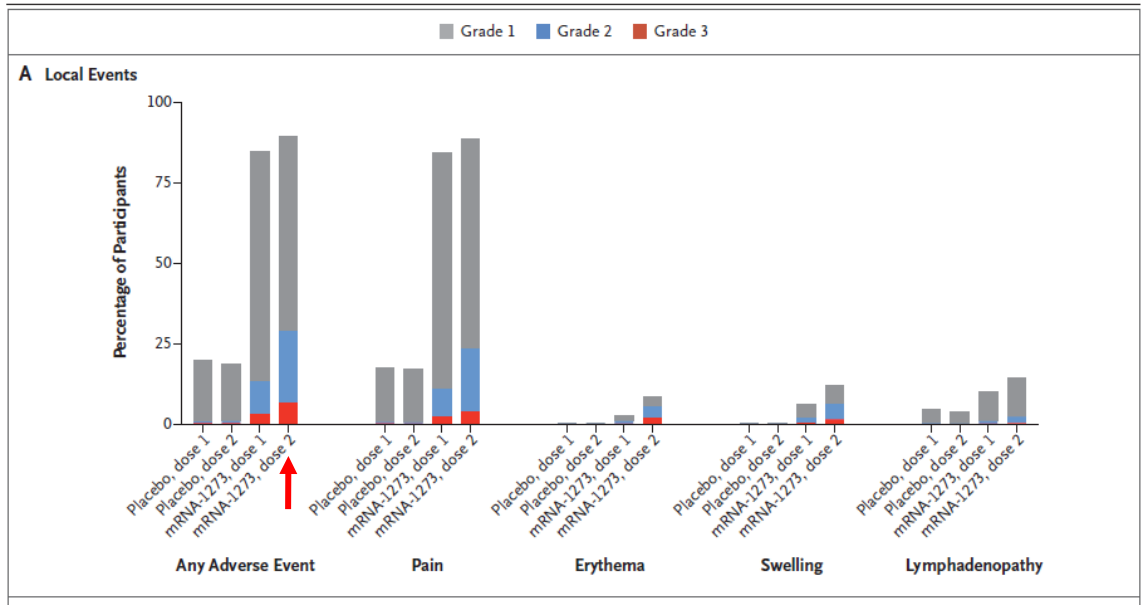


Strong correlation between Live Virus and Pseudovirus assay results

ORIGINAL ARTICLE

Efficacy and Safety of the mRNA-1273 SARS-CoV-2 Vaccine

L.R. Baden, H.M. El Sahly, B. Essink, K. Kotloff, S. Frey, R. Novak, D. Diemert, S.A. Spector, N. Rouphael, C.B. Creech, J. McGettigan, S. Kehtan, N. Segall, J. Solis, A. Brosz, C. Fierro, H. Schwartz, K. Neuzil, L. Corey, P. Gilbert, H. Janes, D. Follmann, M. Marovich, J. Mascola, L. Polakowski, J. Ledgerwood, B.S. Graham, H. Bennett, R. Pajon, C. Knightly, B. Leav, W. Deng, H. Zhou, S. Han, M. Ivarsson, J. Miller, and T. Zaks, for the COVE Study Group*



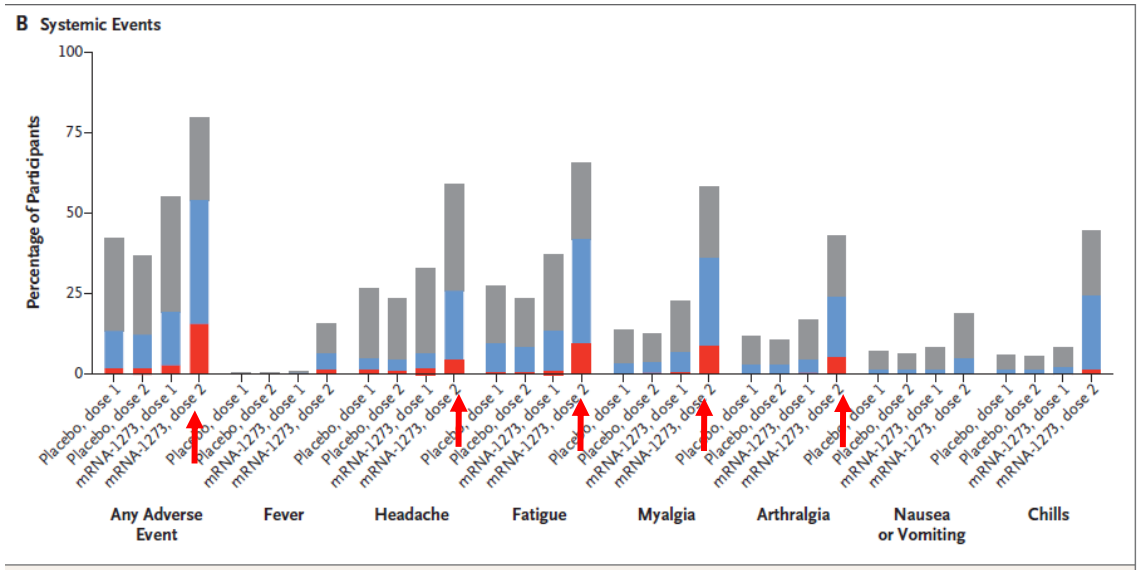
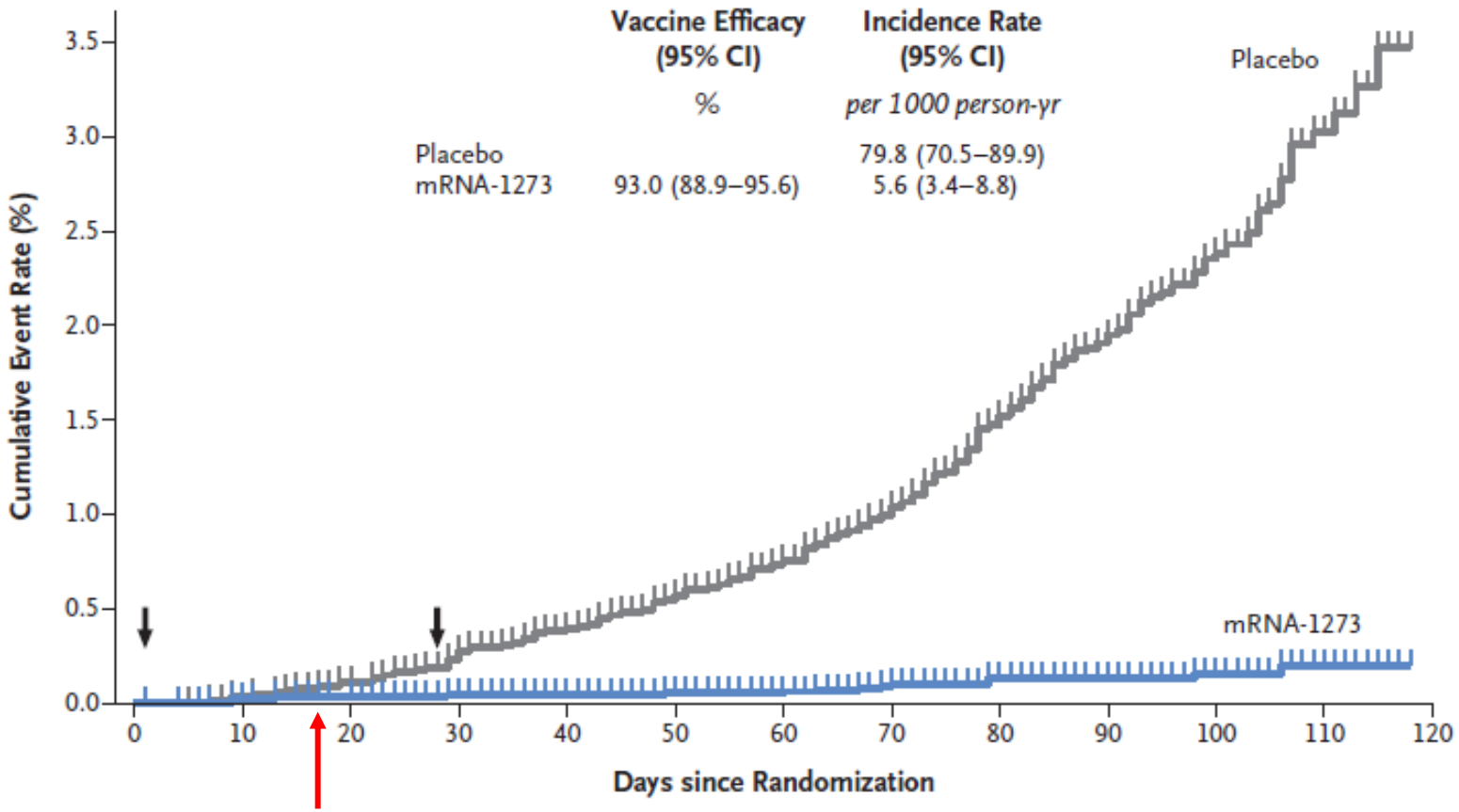


Figure 2. Solicited Local and Systemic Adverse Events.
Shown is the percentage of participants who had a solicited local or systemic adverse event within 7 days after injection 1 or injection 2 of either the placebo or the mRNA-1273 vaccine.

B Modified Intention-to-Treat Analysis

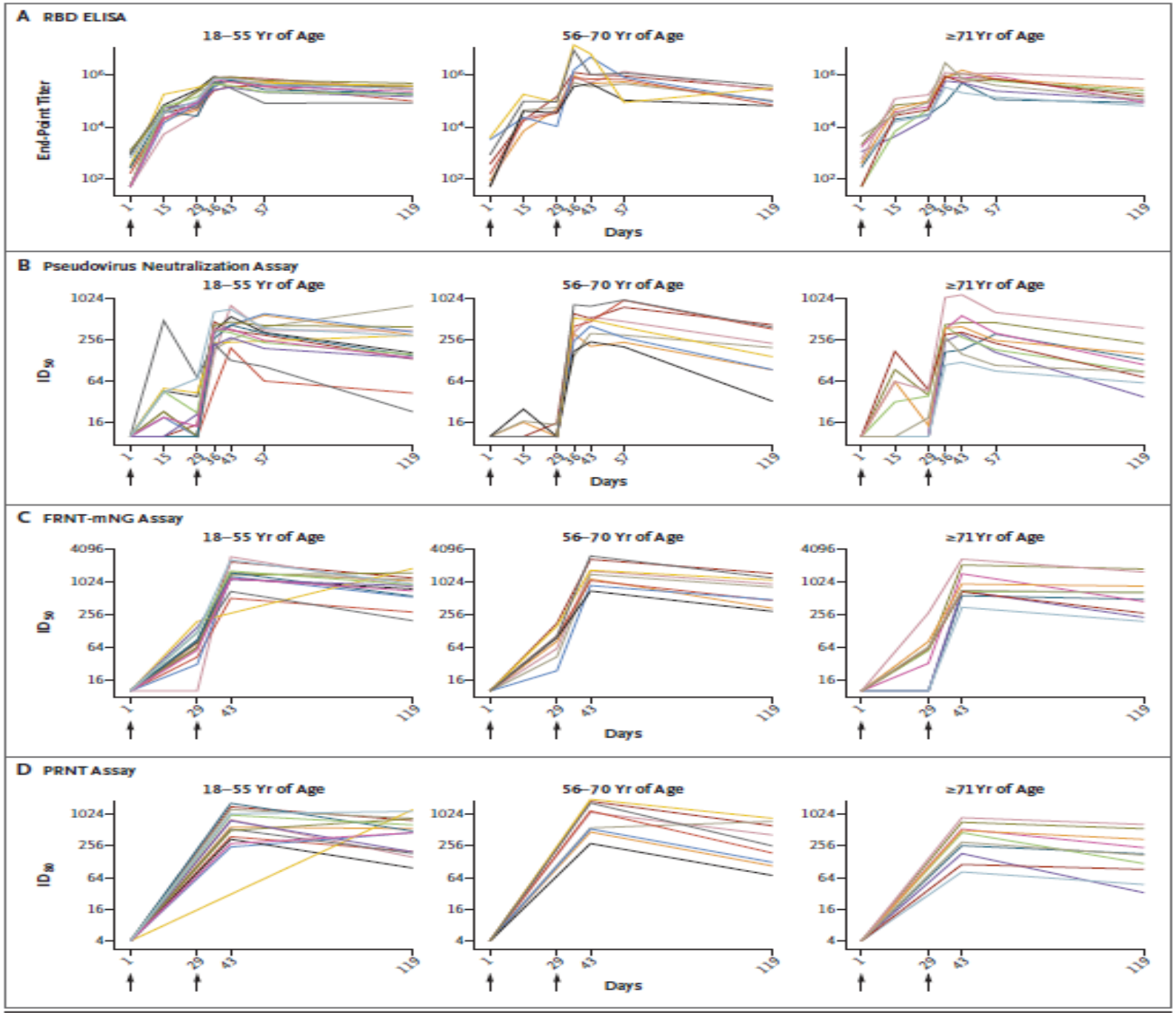


No. at Risk

Placebo	14,598	14,590	14,567	14,515	13,806	12,352	12,694	11,450	9736	6729	4067	1200	0
mRNA-1273	14,550	14,543	14,532	14,504	13,825	13,398	12,791	11,573	9911	6871	4179	1238	0

Covid-19 Onset	Placebo (N=14,598)	mRNA-1273 (N=14,550)
Randomization to 14 days after dose 1	11	5
14 Days after dose 1 to dose 2	35	2
Dose 2 to 14 days after dose 2	19	0
Starting 14 days after dose 2	204	12
Total (any time after randomization)	269	19

Duration of Antibody Response



Widge, Rouphael et al., NEJM, 2021;384(1):80-82

moderna

NIH National Institutes of Health
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VACCINE NAME: mRNA-1273

EFFICACY: 94.5%

DOSE: 2 doses, 4 weeks apart

TYPE: Muscle injection

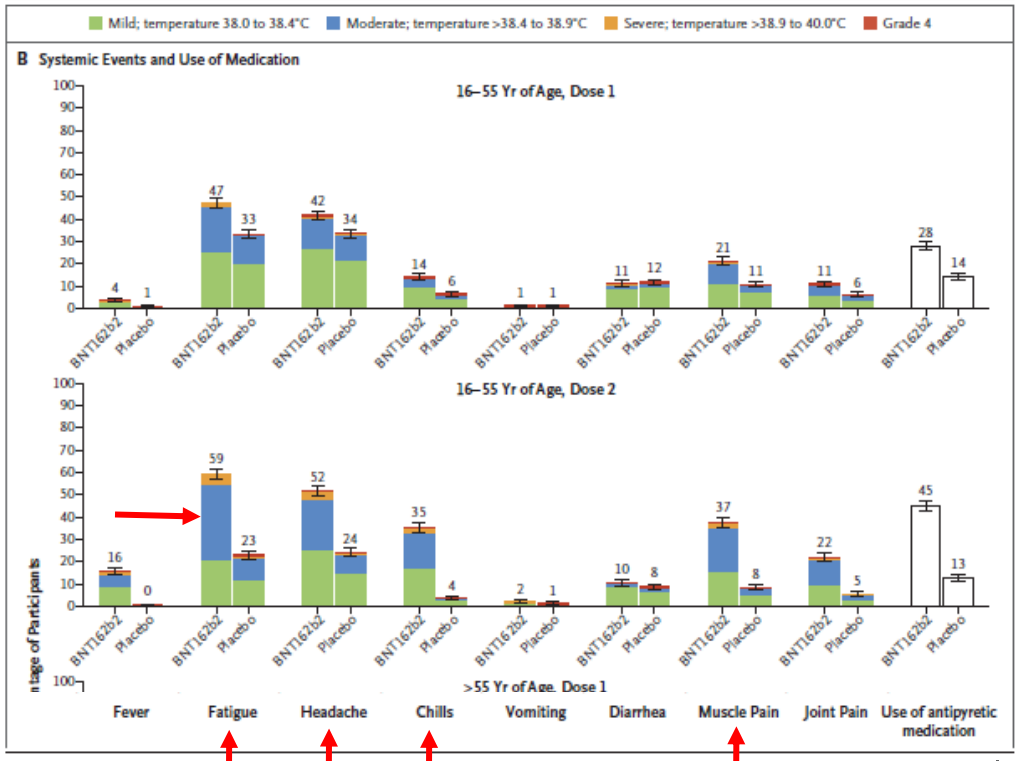
STORAGE: 30 days with refrigeration, 6 months at −4°F (−20°C)

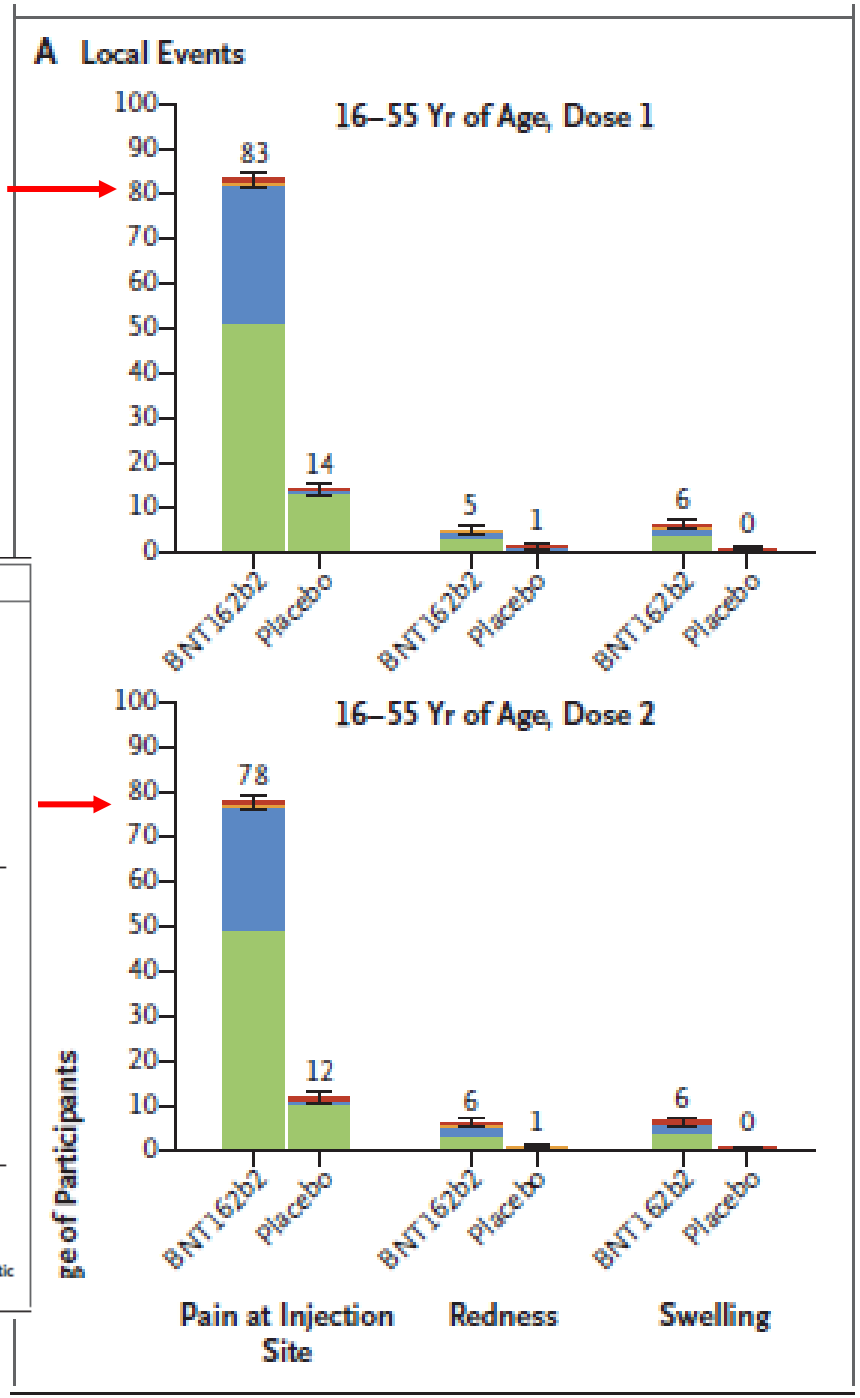
The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Safety and Efficacy of the BNT162b2 mRNA Covid-19 Vaccine

Fernando P. Polack, M.D., Stephen J. Thomas, M.D., Nicholas Kitchin, M.D., Judith Absalon, M.D., Alejandra Gurtman, M.D., Stephen Lockhart, D.M., John L. Perez, M.D., Gonzalo Pérez Marc, M.D., Edson D. Moreira, M.D., Cristiano Zerbini, M.D., Ruth Bailey, B.Sc., Kena A. Swanson, Ph.D., Satrajit Roychoudhury, Ph.D., Kenneth Koury, Ph.D., Ping Li, Ph.D., Warren V. Kalina, Ph.D., David Cooper, Ph.D., Robert W. Frenck, Jr., M.D., Laura L. Hammitt, M.D., Özlem Türeci, M.D., Haylene Nell, M.D., Axel Schaefer, M.D., Serhat Ünal, M.D., Dina B. Tresnan, D.V.M., Ph.D., Susan Mather, M.D., Philip R. Dormitzer, M.D., Ph.D., Uğur Şahin, M.D., Kathrin U. Jansen, Ph.D., and William C. Gruber, M.D., for the C4591001 Clinical Trial Group*





VACCINE NAME: Comirnaty (also known as tozinameran or BNT162b2)

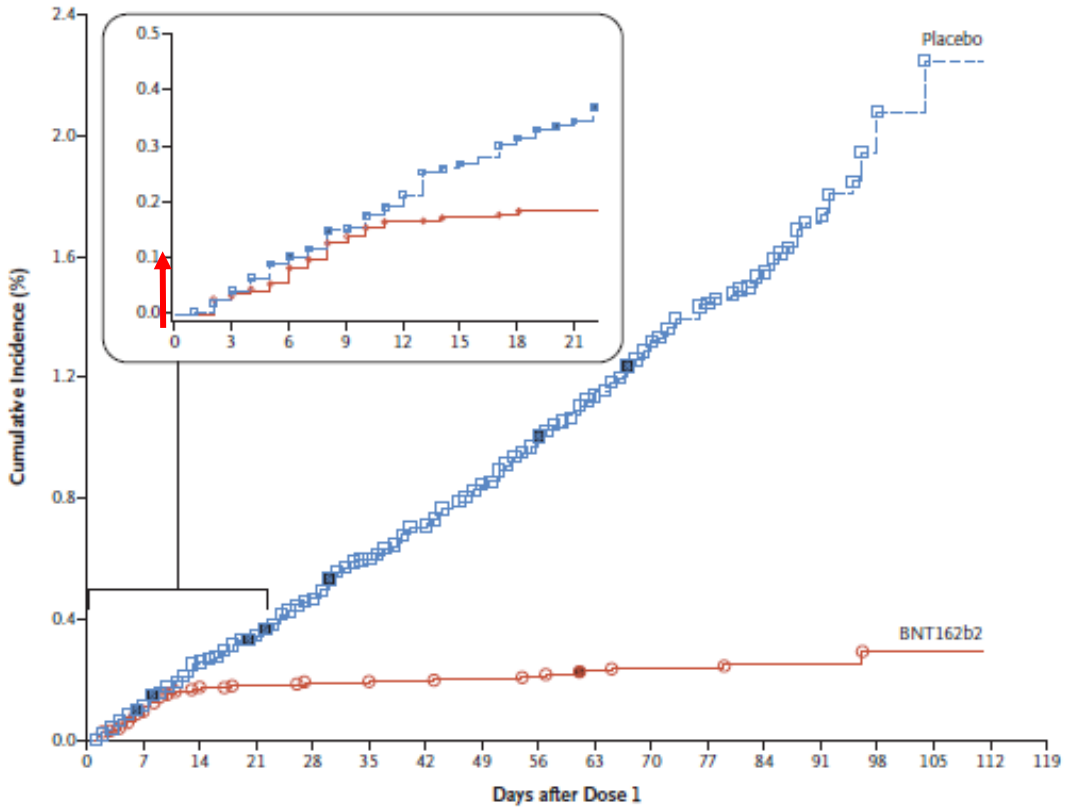
EFFICACY: 95%

DOSE: 2 doses, 3 weeks apart

TYPE: Muscle injection

STORAGE: Freezer storage only at −13°F to 5°F (−25°C to −15°C)

Pfizer-BioNTech
78 COUNTRIES



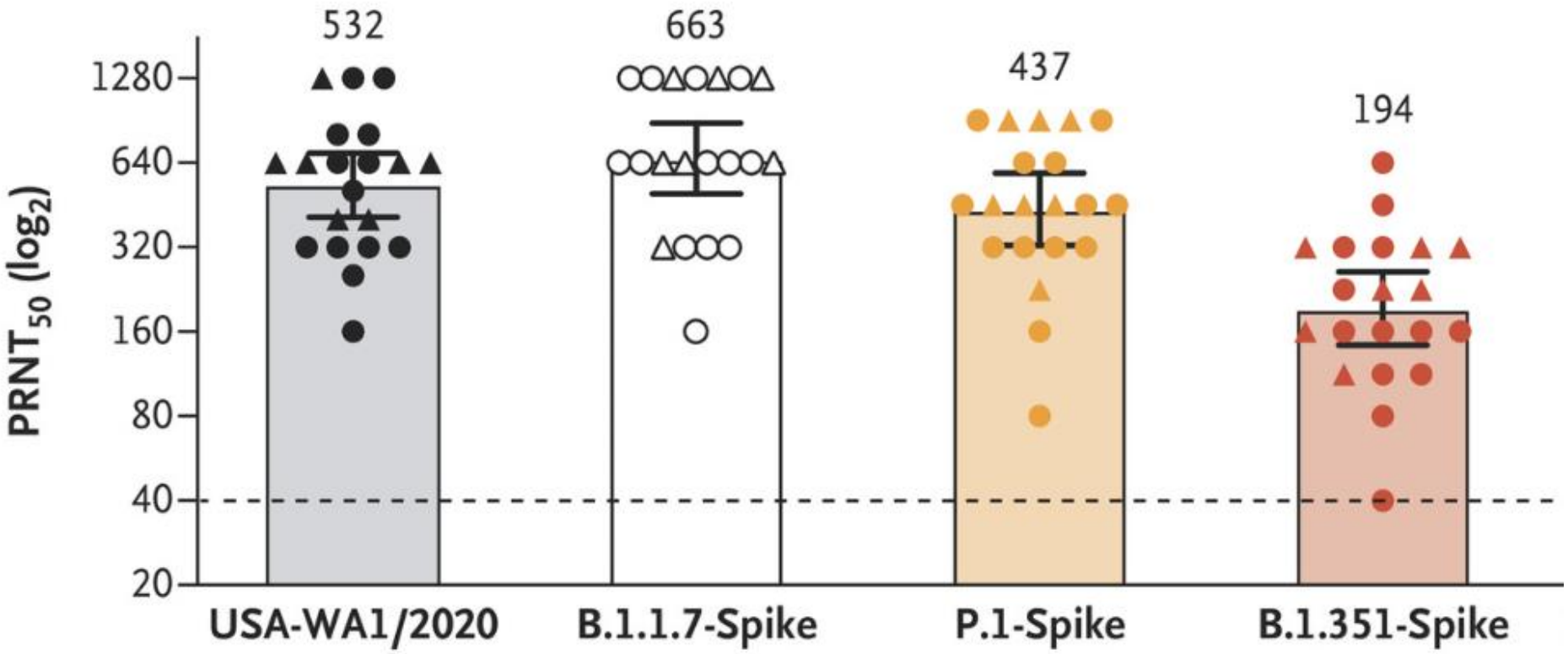
Efficacy End-Point Subgroup	BNT162b2, 30 μg (N=21,669)		Placebo (N=21,686)		VE (95% CI)
	No. of participants	Surveillance time *person-yr (no. at risk)*	No. of participants	Surveillance time *person-yr (no. at risk)*	*percent*
Covid-19 occurrence					
After dose 1	50	4.015 (21,314)	275	3.982 (21,258)	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)

Figure 3. Efficacy of BNT162b2 against Covid-19 after the First Dose.

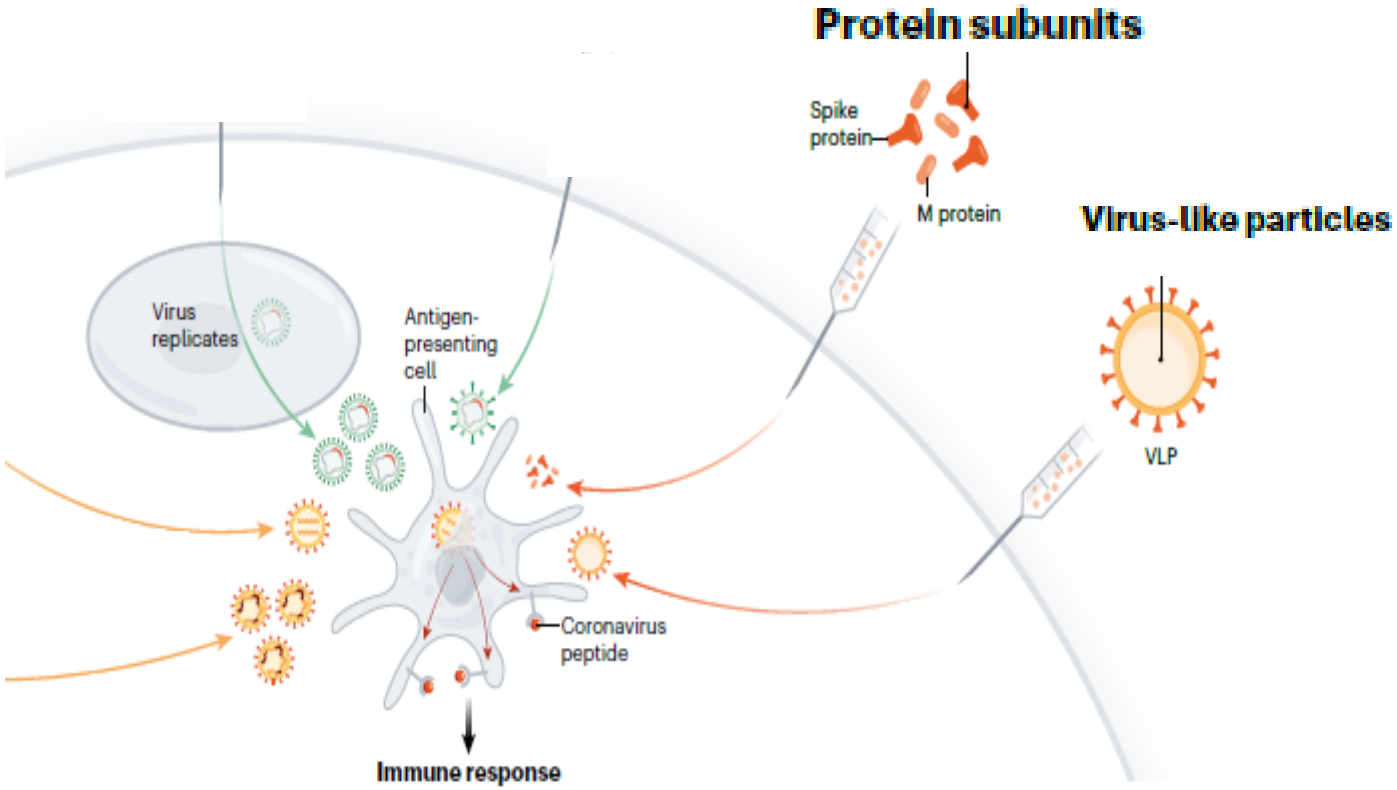
Shown is the cumulative incidence of Covid-19 after the first dose (modified intention-to-treat population). Each symbol represents Covid-19 cases starting on a given day; filled symbols represent severe Covid-19 cases. Some symbols represent more than one case, owing to overlapping dates. The inset shows the same data on an enlarged y axis, through 21 days. Surveillance time is the total time in 1000 person-years for the given end point across all participants within each group at risk for the end point. The time period for Covid-19 case accrual is from the first dose to the end of the surveillance period. The confidence interval (CI) for vaccine efficacy (VE) is derived according to the Clopper–Pearson method.

Variants

Liu et al., NEJM 2021. Mar 08



Protein Based Vaccines



Callaway. Nature, 2020; 580(7805):576-577

NVX-CoV2373-Phase 1/2

NOVAVAX
Creating Tomorrow's Vaccines Today

Phase 1 trial overview

Keech et al., NEJM 2020, Sep 2

Protocol Title **Phase 1-2 Trial of a SARS-CoV-2 Recombinant Spike Protein Nanoparticle Vaccine**

Population 108 adults (mean age 31; 50% male; 79% white)

Study Groups

Dosage (D0, D21)	ELISA (Anti-S) D35	Live Virus Neuts (99) D35	T Cell Response
5 mcg + M1	63,160	3,906	Th1>>>Th2
25 mcg	575	41	---
25 mcg +M1 no second dose	2,932	128	ND
25 mcg +M1	47,521	3,305	Th1>>>Th2
Convalescent	8,344	983	ND

Tolerability Most common: pain and tenderness, fatigue, headache, myalgia, malaise.

Safety More systemic, more frequent severe AE after second vaccination.

*Placebo controlled study

moderna

Moderna Announces it has Shipped Variant-Specific Vaccine Candidate, mRNA-1273.351, to NIH for Clinical Study

February 24, 2021

NEWS / Pfizer and BioNTech Initiate a Study as Part of Broad Development Plan to Evaluate COVID-19 Booster and New Vaccine Variants

PFIZER AND BIONTECH INITIATE A STUDY AS PART OF BROAD DEVELOPMENT PLAN TO EVALUATE COVID-19 BOOSTER AND NEW VACCINE VARIANTS

Thursday, February 25, 2021 - 06:45am

Wednesday, March 31, 2021

NIH clinical trial evaluating Moderna COVID-19 variant vaccine begins

Early-stage trial to evaluate safety and immunogenicity.

Centers for Disease Control and Prevention
MMWR
Morbidity and Mortality Weekly Report
Early Release / Vol. 70
February 19, 2021

First Month of COVID-19 Vaccine Safety Monitoring — United States, December 14, 2020–January 13, 2021

Julianne Gee[1]; Paige Marquez[1]; John Su[1]; Geoffrey M. Calvert[1]; Ruiling Liu[1]; Tanya Myers[1]; Narayan Nair[2]; Stacey Martin[1]; Thomas Clark[1]; Lauri Markowitz[1]; Nicole Lindsey[1]; Bicheng Zhang[1]; Charles Licata[1]; Amelia Jazwa[1]; Mark Sotir[1]; Tom Shimabukuro[1]

Reports of anaphylaxis have been observed after administration of both vaccines (*5*). The occurrence of anaphylaxis after receipt of COVID-19 vaccines during the analytic period, 4.5 cases per million doses administered, is within the range reported after receipt of inactivated influenza vaccine (1.4 per million), pneumococcal polysaccharide vaccine (2.5 per million), and live attenuated herpes zoster vaccine (9.6 per million); effective treatments for anaphylaxis exist (*6*).

BNT162b2 mRNA Covid-19 Vaccine in a Nationwide Mass Vaccination Setting

Noa Dagan, M.D., Noam Barda, M.D., Eldad Kepten, Ph.D., Oren Miron, M.A., Shay Perchik, M.A., Mark A. Katz, M.D., Miguel A. Hernán, M.D., Marc Lipsitch, D.Phil., Ben Reis, Ph.D., and Ran D. Balicer, M.D.

DOI: 10.1056/NEJMoa2101765
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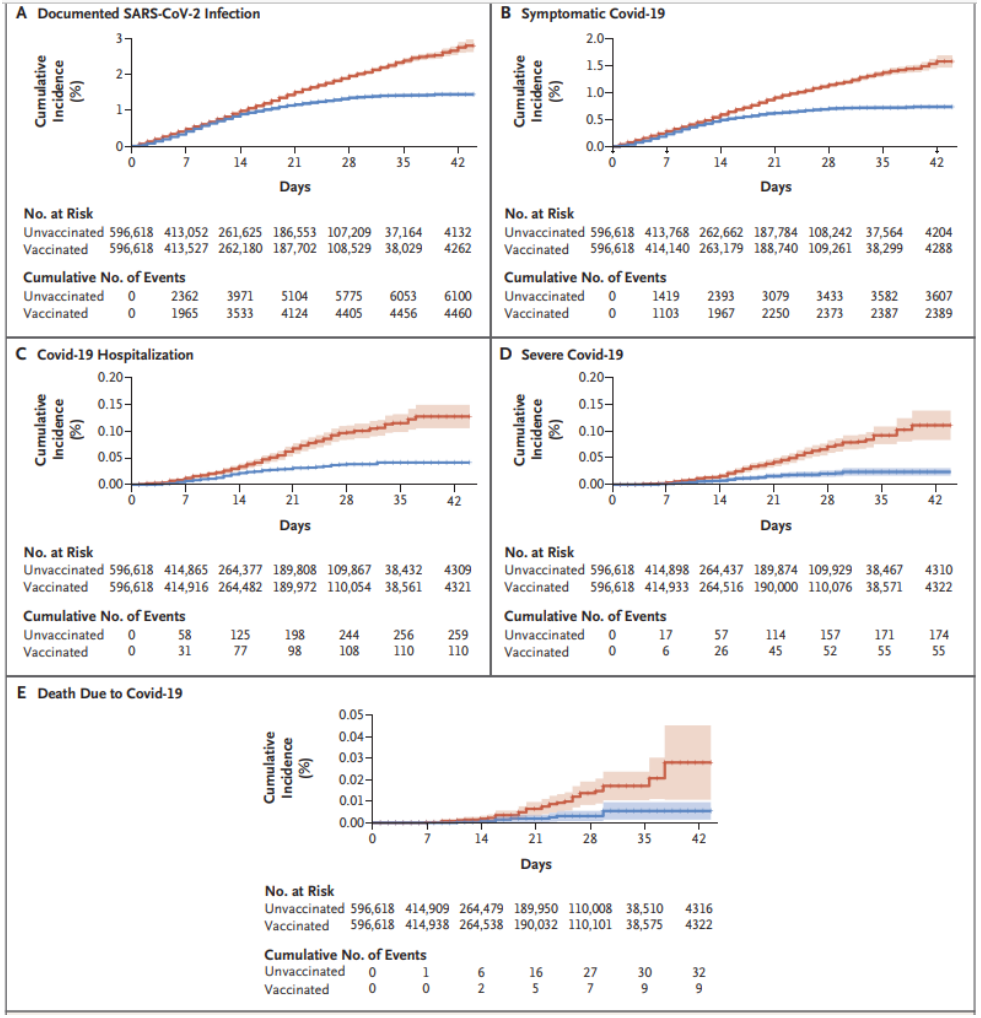


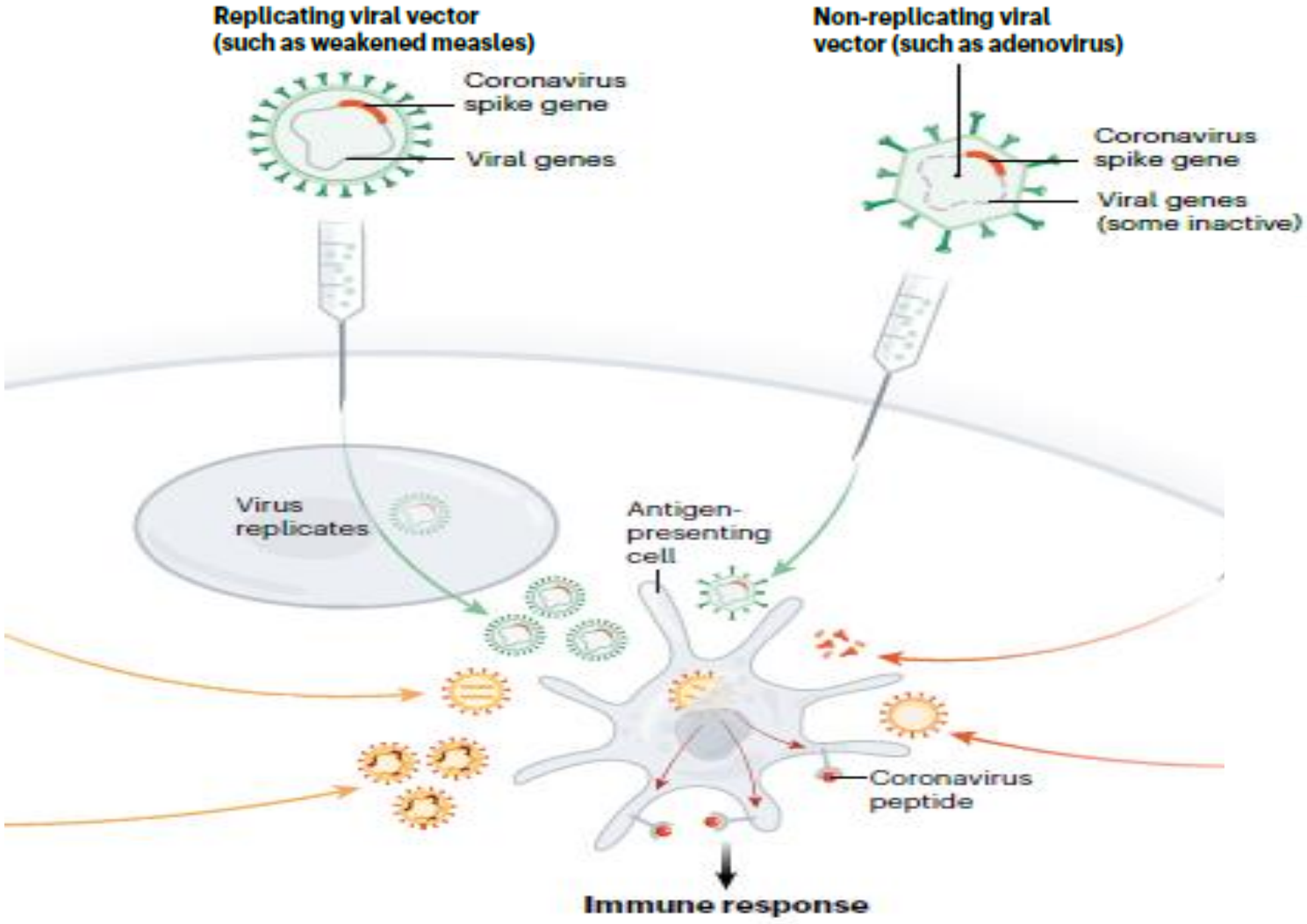
CDC Real-World Study Confirms Protective Benefits of mRNA COVID-19 Vaccines

The study looked at the effectiveness of Pfizer-BioNTech and Moderna mRNA vaccines in preventing SARS-CoV-2 infections among 3,950 study participants in six states over a 13-week period from December 14, 2020 to March 13, 2021.

Results showed that following the second dose of vaccine (the recommended number of doses), risk of infection was reduced by 90 percent two or more weeks after vaccination. Following a single dose of either vaccine, the participants' risk of infection with SARS-CoV-2 was reduced by 80 percent two or more weeks after vaccination.

https://www.cdc.gov/media/releases/2021/p0329-COVID-19-Vaccines.html

Viral Vector Vaccines



Callaway. Nature, 2020; 580(7805):576-577

Adenovirus Ad26 Phase 1/2

janssen | PHARMACEUTICAL COMPANIES OF Johnson & Johnson

Phase 2 trial overview **COHORT 1A**

Sadoff, Jerald et al., NEJM Jan 2021

Protocol Title **Safety and immunogenicity of the Ad26.COV2.S COVID-19 vaccine candidate: interim results of a phase 1/2a, double-blind, randomized, placebo-controlled trial.**

Population Healthy adults 18-55 years old, median age of 35.

Study Groups	Dosage (D0,56)	ELISA (D29)	Neuts (D29)	CD4/Th1 (D15)	TCD4/Th2 (D15)	CD8+ T (D15)
	5E10 viral particles	586	224	76%	negligible	51%
	1E11 viral particles	788	354	83%	negligible	64%

Tolerability Most common: injection site pain, fatigue, headache and myalgia and fever (15-39%)
Grade 3 systemic AE in 9-20%.

Safety No grade 4 AE. 2 SAE- No discontinuation from AE.

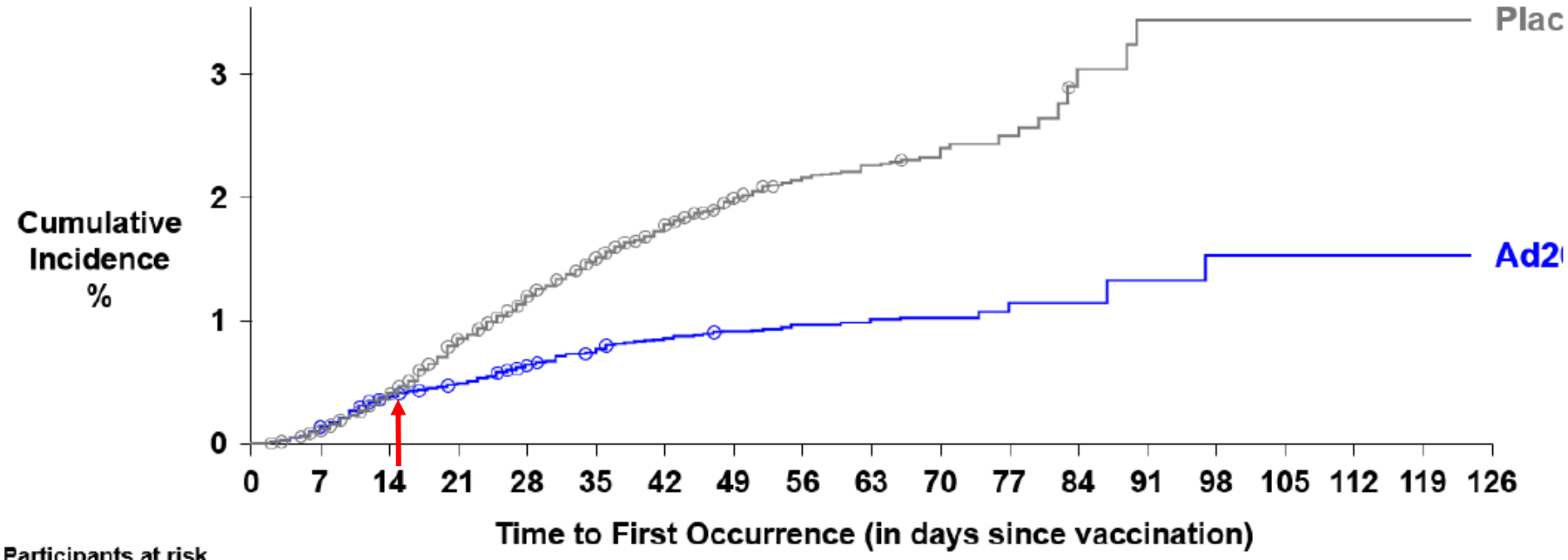
Table 1: Selected Primary and Secondary Endpoints, Per Protocol Population (Study COV3001)

Per Protocol (PP)	Day 14 Ad26.COV2.S N=19,630	Day 14 Placebo N=19,691	Day 14 VE (95% CI)[a]	Day 28 Ad26.COV2.S N=19,630	Day 28 Placebo N=19,691	Day 28 VE (95% CI)[a]
Per Protocol At Risk set[b]	19,514	19,544		19,306	19,178	
Primary endpoints (PCR+ by central laboratory)[c]	# Cases	# Cases		# Cases	# Cases	
Moderate to severe/critical	116	348	66.9% *(59.03; 73.40)	66	193	66.1% *(55.01; 74.80)
Secondary endpoints (PCR+ by central laboratory)[c]	# Cases	# Cases		# Cases	# Cases	
Any symptomatic COVID-19 severity	117	351	66.9% (59.1 73.4)	66	195	66.5% (55.5, 75.1)
Mild	1	3		0	2	
Moderate	102	288	64.8% (55.8, 72.2)	61	159	62.0% (48.7, 72.2)
Severe/critical	14	60	76.7% *(54.6, 89.1)	5	34	85.4% *(54.2, 96.9)
All symptomatic COVID-19 (BOD)[e]	117	351	68.1% *(60.3, 74.3)	66	195	69.0% *(56.7, 77.6)
Age 18-59 years	95	260	65.8% (56.2, 73.1)	52	152	69.3% (57.4, 77.7)
Age ≥60 years	22	91	74.5% (57.9, 84.3)	14	43	67.9% (38.2, 82.8)

Table 2: COVID-19 Related Hospitalizations

	Ad26.COV2.S Cases, n	Placebo Cases, n	VE (95% CI)
At least 1 day after vaccination[a], FAS-SN			
PCR+ by central laboratory[b]	6	18	66.6% (12.06; 89.13)
PCR+ from any source[c]	6	42	85.7% (66.13; 95.02)
At least 14 days after vaccination[a], PP			
PCR+ by central laboratory[b]	2	11	81.8% (16.69; 98.04)
PCR+ from any source[c]	2	29	93.1% (72.74; 99.20)
At least 28 days after vaccination[a], PP			
PCR+ by central laboratory[b]	0	6	100.0% (15.67; 100.00)
PCR+ from any source[c]	0	16	100.0% (74.26; 100.00)

Figure 12: Cumulative Incidence of Molecularly Confirmed Moderate to Severe/Critical COVID-19 Cases with Onset at Least 1 Day after Vaccination up to Day 126, Full Analysis Set (Study COV3001)

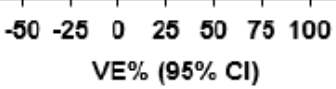


Participants at risk																			
Ad26.COV2.S	19744	19725	19669	19642	19612	19578	18541	14909	10930	7831	3998	1468	713	484	483	482	142	31	0
Placebo	19822	19804	19745	19652	19579	19488	18411	14814	10823	7740	3876	1439	708	485	482	480	133	27	0
Number of cases																			
Ad26.COV2.S	0	27	76	96	126	151	168	178	184	188	189	191	191	192	193	193	193	193	193
Placebo	0	22	81	168	237	299	351	387	407	416	423	425	430	432	432	432	432	432	432

Note: Severe cases are marked as blue or grey circles on the graphs.

Figure 18: Vaccine Efficacy Against Moderate to Severe/Critical COVID-19 at Least 28 Days After Vaccination by Demographic and Baseline Characteristics, Per Protocol Population (Study COV3001)

Per Protocol Population	# Events / N: Ad26.COV2.S N = 19,630	# Events / N: Placebo N = 19,691	Moderate to Severe / Critical	Day 28 Vaccine Efficacy (95% CI)
PP Risk Set	113 / 19,306	324 / 19,178		65.5% (57.2, 72.4)
Age and risk				
≥ 18 and <60 without comorbidities	58 / 8,267	180 / 8,254		68.0% (56.8, 76.6)
≥ 18 and <60 with comorbidities	29 / 4,350	79 / 4,273		64.0% (44.3, 77.3)
≥ 60 without comorbidities	11 / 3,355	39 / 3,298		72.4% (45.0, 87.3)
≥ 60 with comorbidities	15 / 3,334	26 / 3,353		42.3% (-13.1, 71.6)
Sex				
Male	54 / 10,764	176 / 10,649		69.8% (58.9, 78.2)
Female	59 / 8,538	148 / 8,525		60.3% (46.0, 71.2)
Participants with comorbidities (all ages)				
Yes	44 / 7,684	105 / 7,626		58.6% (40.6, 71.6)
No	69 / 11,622	219 / 11,552		68.8% (59.0, 76.6)
Race and ethnicity				
Non-Hispanic / Latino	52 / 10,131	163 / 9,957		68.8% (57.2, 77.6)
Hispanic / Latino	59 / 8,688	153 / 8,741		61.3% (47.4, 71.8)
White	64 / 11,994	187 / 11,912		66.2% (54.8, 74.9)
Black	21 / 3,330	66 / 3,300		68.6% (48.0, 81.8)
Region				
Latin America	58 / 7,899	148 / 7,880		61.0% (46.9, 71.8)
United States	32 / 8,958	112 / 8,835		72.0% (58.2, 81.7)
South Africa	23 / 2,449	64 / 2,463		64.0% (41.2, 78.7)
Country				
Argentina	7 / 1,398	23 / 1,400		69.6% (26.7, 89.0)
Brazil	24 / 3,354	74 / 3,312		68.1% (48.8, 80.7)
Chile	2 / 531	2 / 538		
Columbia	18 / 1,840	40 / 1,835		55.3% (20.3, 75.9)
Mexico	0 / 205	0 / 220		
Peru	7 / 571	9 / 575		21.3% (-137.6, 75.1)
United States	32 / 8,958	112 / 8,835		72.0% (58.2, 81.7)
South Africa	23 / 2,449	64 / 2,463		64.0% (41.2, 78.7)



Johnson&Johnson | Beth Israel Lahey Health Beth Israel Deaconess Medical Center | janssen

VACCINE NAME: Ad26.COV2.S

EFFICACY: 72% in United States, 64% in South Africa, 61% in Latin America

DOSE: 1 dose

TYPE: Muscle injection

STORAGE: Up to two years frozen at −4° F (−20° C), and up to three months refrigerated at 36–46° F (2–8° C).

Safety and efficacy of the ChAdOx1 nCoV-19 vaccine (AZD1222) against SARS-CoV-2: an interim analysis of four randomised controlled trials in Brazil, South Africa, and the UK

Merryn Voysey, Sue Ann Costa Clemens*, Shabir A Madhi*, Lily Y Weckx*, Pedro M Folegatti*, Parvinder K Aley, Brian Angus, Vicky L Baillie, Shaun L Barnabas, Qasim E Bhorat, Sagida Bibi, Carmen Briner, Paola Cicconi, Andrea M Collins, Rachel Colin-Jones, Clare L Cutland, Thomas C Darton, Keertan Dheda, Christopher J A Duncan, Katherine R W Emary, Katie J Ewer, Lee Fairlie, Saul N Faust, Shuo Feng, Daniela M Ferreira, Adam Finn, Anna L Goodman, Catherine M Green, Christopher A Green, Paul T Heath, Catherine Hill, Helen Hill, Ian Hirsch, Susanne H C Hodgson, Alane Izu, Susan Jackson, Daniel Jenkin, Carina C D Joe, Simon Kerridge, Anthonet Koen, Gaurav Kwatra, Rajeka Lazarus, Alison M Lawrie, Alice Lelliott, Vincenzo Libri, Patrick J Lillie, Raburn Mallory, Ana V A Mendes, Eveline P Milan, Angela M Minassian, Alastair McGregor, Hazel Morrison, Yama F Mujadidi, Anusha Nana, Peter J O'Reilly, Sherman D Padayachee, Ana Pittella, Emma Plested, Katrina M Pollock, Maheshi N Ramasamy, Sarah Rhead, Alexandre V Schwarzbold, Nisha Singh, Andrew Smith, Rinn Song, Matthew D Snape, Eduardo Sprinz, Rebecca K Sutherland, Richard Tarrant, Emma C Thomson, M Estée Török, Mark Toshner, David P J Turner, Johan Vekemans, Tonya L Villafana, Marion E E Watson, Christopher J Williams, Alexander D Douglas*, Adrian V S Hill*, Teresa Lambe*, Sarah C Gilbert*, Andrew J Pollard* on behalf of the Oxford COVID Vaccine Trial Group†*

	Total number of cases	ChAdOx1 nCoV-19		Control		Vaccine efficacy (CI*)
		n/N (%)	Incidence rate per 1000 person-years (person-days of follow-up)	n/N (%)	Incidence rate per 1000 person-years (person-days of follow-up)	
All LD/SD and SD/SD recipients	131	30/5807 (0·5%)	44·1 (248 299)	101/5829 (1·7%)	149·2 (247 228)	70·4% (54·8 to 80·6)†
COV002 (UK)	86	18/3744 (0·5%)	38·6 (170 369)	68/3804 (1·8%)	145·7 (170 448)	73·5% (55·5 to 84·2)
LD/SD recipients	33	3/1367 (0·2%)	14·9 (73 313)	30/1374 (2·2%)	150·2 (72 949)	90·0% (67·4 to 97·0)‡§
SD/SD recipients	53	15/2377 (0·6%)	56·4 (97 056)	38/2430 (1·6%)	142·4 (97 499)	60·3% (28·0 to 78·2)
COV003 (Brazil; all SD/SD)	45	12/2063 (0·6%)	56·2 (77 930)	33/2025 (1·6%)	157·0 (76 780)	64·2% (30·7 to 81·5)‡
All SD/SD recipients	98	27/4440 (0·6%)	56·4 (174 986)	71/4455 (1·6%)	148·8 (174 279)	62·1% (41·0 to 75·7)
Other non-primary symptomatic COVID-19 disease¶	18	7/5807 (0·1%)	10·3 (248 299)	11/5829 (0·2%)	16·3 (247 228)	36·4% (−63·8 to 75·3)‡
Any symptomatic COVID-19 disease	149	37/5807 (0·6%)	54·4 (248 299)	112/5829 (1·9%)	165·5 (247 228)	67·1% (52·3 to 77·3)
Asymptomatic or symptoms unknown (COV002)	69	29/3288 (0·9%)	69·8 (151 673)	40/3350 (1·2%)	96·0 (152 138)	27·3% (−17·2 to 54·9)
LD/SD recipients	24	7/1120 (0·6%)	41·4 (61 782)	17/1127 (1·5%)	100·6 (61 730)	58·9% (1·0 to 82·9)‡
SD/SD recipients	45	22/2168 (1·0%)	89·4 (89 891)	23/2223 (1·0%)	92·9 (90 408)	3·8% (−72·4 to 46·3)
Any NAAT-positive swab	221	68/5807 (1·2%)	100·0 (248 299)	153/5829 (2·6%)	226·0 (247 228)	55·7% (41·1 to 66·7)

Vaccine efficacy was calculated from the robust Poisson model. The primary efficacy population (LD/SD and SD/SD) includes randomly assigned participants who were seronegative at baseline and received LD/SD or SD/SD or were in a corresponding control group, and remained on study more than 14 days after their second dose without having had a previous virologically confirmed SARS-CoV-2 infection. In addition, for groups in COV002, only efficacy groups (ie, groups 4, 6, 9, and 10) are included. SARS-CoV-2=severe acute respiratory syndrome coronavirus 2. LD/SD=low-dose prime plus standard-dose boost. SD/SD=two standard-dose vaccines given. NAAT=nucleic acid amplification test. *CIs are 95% unless indicated otherwise. †95·8% CI used for primary analysis. ‡Vaccine efficacy calculated from a reduced robust Poisson model that was not adjusted for age. All other models included an adjustment for age. §p value for interaction term comparing LD/SD with SD/SD is p=0·010. ¶Other non-primary symptomatic COVID-19 disease includes cases who have symptoms other than the five main symptoms that are required for inclusion in the primary analysis (eg, a participant who has diarrhoea and malaise but no fever, cough, shortness of breath, anosmia, or ageusia).

***Table 2:* Efficacy against SARS-CoV-2 more than 14 days after a second dose of ChAdOx1 nCoV-19 vaccine in the primary efficacy population**

https://www.wits.ac.za/covid19/covid19-news/latest/oxford-covid-19-vaccine-trial-results.html

- Wits Emergency Response: COVID-19
- COVID19 News
- University updates
- Covid19 Vaccine
- Wits Journal of Medicine
- Wits Resources
- Important Contacts

7 February 2021 - Wits University

The Wits Vaccines and Infectious Diseases Analytics (VIDA) Research Unit, which runs the Oxford Covid-19 vaccine trial in South Africa, has announced results.

In an analysis, submitted as a pre-print prior to peer-review publication, a two-dose regimen of the ChAdOx1 nCoV-19 vaccine provides minimal protection against mild-moderate COVID-19 infection from the B.1.351 coronavirus variant first identified in South Africa in mid-November 2020.

Efficacy against severe COVID-19 infection from this variant was not assessed. The analyses being submitted in the pre-print show the vaccine had high efficacy against the original coronavirus non-B.1.351 variants in South Africa.

Oxford-AstraZeneca
86 COUNTRIES

UNIVERSITY OF OXFORD AstraZeneca

VACCINE NAME: AZD1222 (also known as Covishield in India)

EFFICACY: 82.4% for doses separated by 12 weeks.

DOSE: 2 doses

TYPE: Muscle injection

STORAGE: Stable in refrigerator for at least 6 months

EUROPEAN MEDICINES AGENCY
SCIENCE MEDICINES HEALTH

COVID-19 Vaccine AstraZeneca: benefits still outweigh the risks despite possible link to rare blood clots with low blood platelets

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News 18/03/2021

- the benefits of the vaccine in combating the still widespread threat of COVID-19 (which itself results in clotting problems and may be fatal) continue to outweigh the risk of side effects;
- the vaccine is not associated with an increase in the overall risk of blood clots (thromboembolic events) in those who receive it;
- there is no evidence of a problem related to specific batches of the vaccine or to particular manufacturing sites;
- however, the vaccine may be associated with very rare cases of blood clots associated with thrombocytopenia, i.e. low levels of blood platelets (elements in the blood that help it to clot) with or without bleeding, including rare cases of clots in the vessels draining blood from the brain (CVST).

AstraZeneca's Covid-19 Vaccine Is Found to Be 79% Effective in U.S. Study

The company is preparing to apply for emergency authorization from the Food and Drug Administration. But the shot may not be needed in the United States.

NEWS RELEASES

Tuesday, March 23, 2021

NIAID Statement on AstraZeneca Vaccine

МИНИСТЕРСТВО
ЗДРАВООХРАНЕНИЯ
РОССИЙСКОЙ ФЕДЕРАЦИИ

Safety and efficacy of an rAd26 and rAd5 vector-based heterologous prime-boost COVID-19 vaccine: an interim analysis of a randomised controlled phase 3 trial in Russia

Denis Y Logunov, Inna V Dolzhikova*, Dmitry V Shcheblyakov, Amir I Tukhvatulin, Olga V Zubkova, Alina S Dzharullaeva, Anna V Kovyrshina, Nadezhda L Lubenets, Daria M Grousova, Alina S Erokhova, Andrei G Botikov, Fatima M Izhaeva, Olga Popova, Tatiana A Ozharovskaya, Ilias B Esmagambetov, Irina A Favorskaya, Denis I Zrelkin, Daria V Voronina, Dmitry N Shcherbinin, Alexander S Semikhin, Yana V Simakova, Elizaveta A Tokarskaya, Daria A Egorova, Maksim M Shmarov, Natalia A Nikitenko, Vladimir A Gushchin, Elena A Smolyarchuk, Sergey K Zyryanov, Sergei V Borisevich, Boris S Naroditsky, Alexander L Gintsburg, and the Gam-COVID-Vac Vaccine Trial Group†*

VACCINE NAME: Sputnik V (also known as Gam-Covid-Vac)

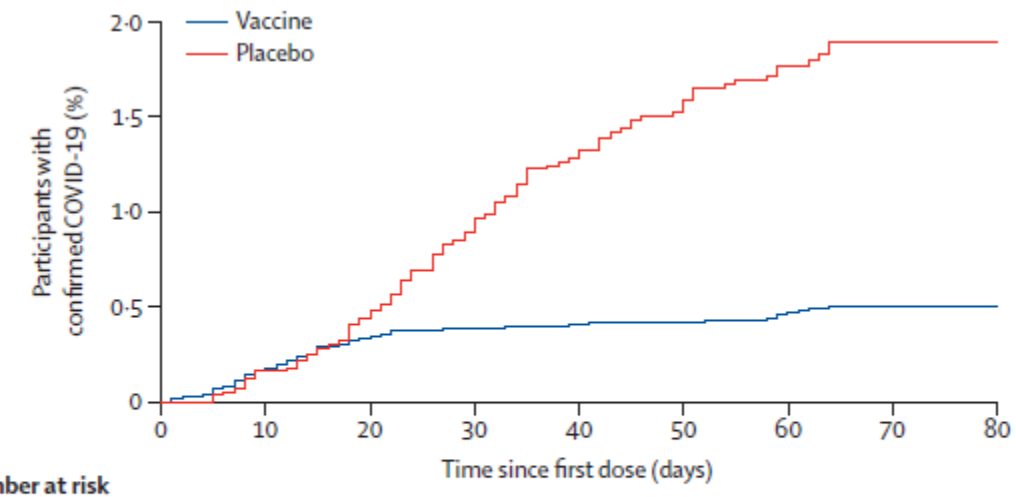
EFFICACY: 91.6%

DOSE: 2 doses, 3 weeks apart

TYPE: Muscle injection

STORAGE: Freezer storage. Developing an alternative formulation that can be refrigerated.

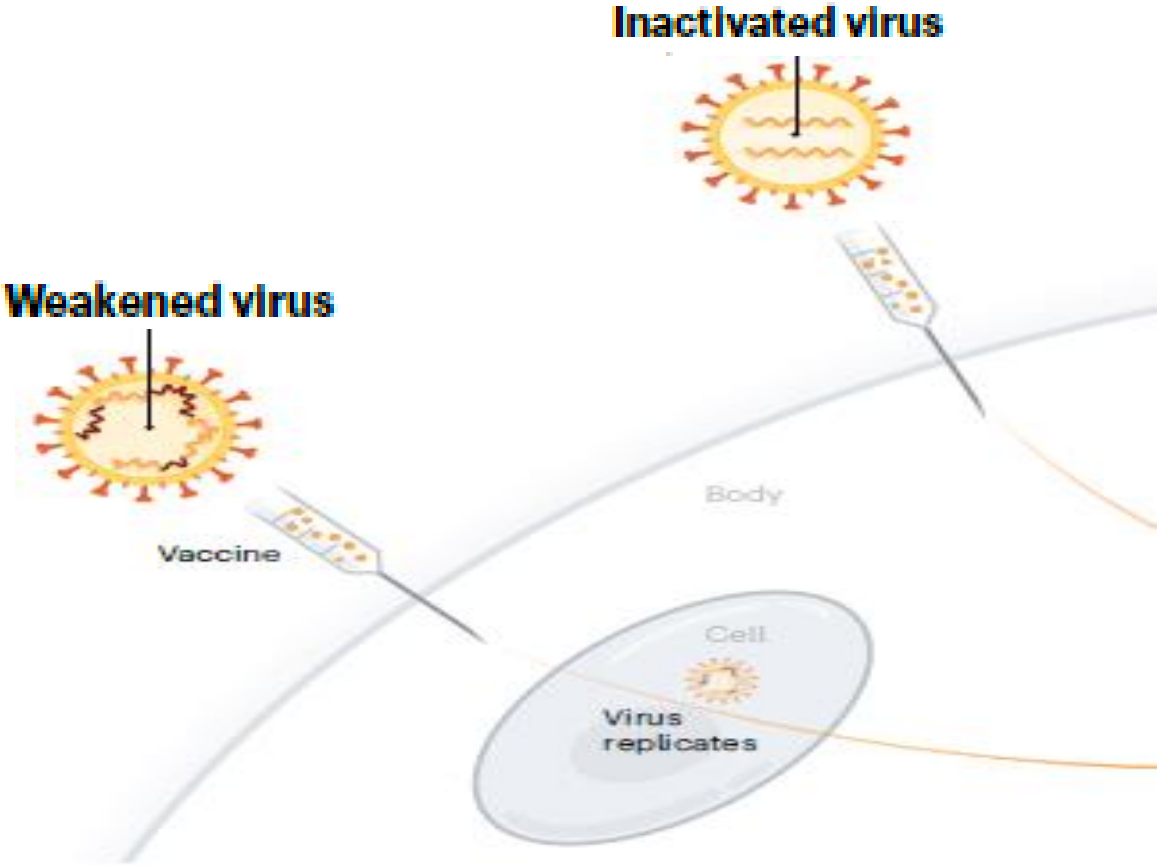
Gamaleya (Sputnik V)
19 COUNTRIES



Number at risk (number of COVID-19 cases)

Vaccine	16 427 (0)	15 338 (35)	15 117 (61)	14 683 (66)	10 970 (70)	6686 (71)	3314 (77)	398 (79)
Placebo	5435 (0)	5121 (10)	5046 (30)	4895 (54)	3662 (71)	2223 (87)	1106 (92)	133 (96)

Virus Vaccines



Callaway. Nature, 2020; 580(7805):576-577

VACCINE NAME: BBIBP-CorV

EFFICACY: 79.34%

DOSE: 2 doses, 3 weeks apart

TYPE: Muscle injection

Sinopharm-Beijing
19 COUNTRIES

VACCINE NAME: CoronaVac (formerly PiCoVacc)

EFFICACY: 50.38% in Brazil trial, 83.5% in Turkey trial

DOSE: 2 doses, 2 weeks apart

TYPE: Muscle injection

STORAGE: Refrigerated

Sinovac
15 COUNTRIES

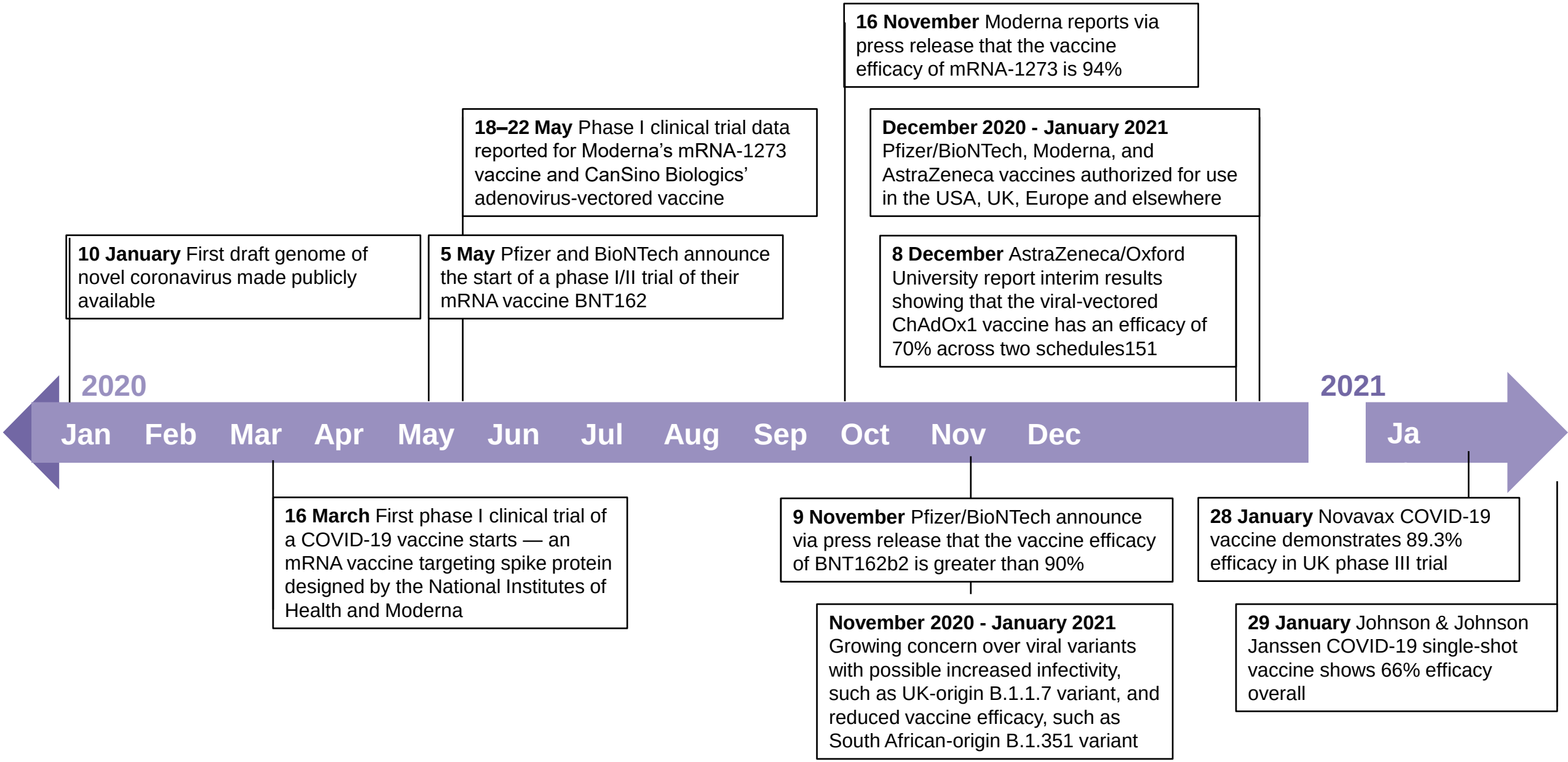
VACCINE NAME: Covaxin (also known as BBV152 A, B, C)

EFFICACY: 80.6%

DOSE: 2 doses, 4 weeks apart

STORAGE: At least a week at room temperature

Bharat Biotech (Covaxin)
1 COUNTRY


16 November Moderna reports via press release that the vaccine efficacy of mRNA-1273 is 94%
18–22 May Phase I clinical trial data reported for Moderna's mRNA-1273 vaccine and CanSino Biologics' adenovirus-vectored vaccine
December 2020 - January 2021 Pfizer/BioNTech, Moderna, and AstraZeneca vaccines authorized for use in the USA, UK, Europe and elsewhere
10 January First draft genome of novel coronavirus made publicly available
5 May Pfizer and BioNTech announce the start of a phase I/II trial of their mRNA vaccine BNT162
8 December AstraZeneca/Oxford University report interim results showing that the viral-vectored ChAdOx1 vaccine has an efficacy of 70% across two schedules151
2020
2021
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16 March First phase I clinical trial of a COVID-19 vaccine starts — an mRNA vaccine targeting spike protein designed by the National Institutes of Health and Moderna
9 November Pfizer/BioNTech announce via press release that the vaccine efficacy of BNT162b2 is greater than 90%
28 January Novavax COVID-19 vaccine demonstrates 89.3% efficacy in UK phase III trial
November 2020 - January 2021 Growing concern over viral variants with possible increased infectivity, such as UK-origin B.1.1.7 variant, and reduced vaccine efficacy, such as South African-origin B.1.351 variant
29 January Johnson & Johnson Janssen COVID-19 single-shot vaccine shows 66% efficacy overall

	Moderna (mRNA-1273)	Pfizer (BNT162b2)	AstraZeneca/ Oxford (AZD1222)	J&J (JNJ-78436735)	Novavax (NVX-CoV2373)	Sputnik (Gam-COVID-Vac)
Type of trial	Phase 3 RCT	Phase 3 RCT	Phase 3 RCT	Phase 3 RCT	Phase 3 RCT	Phase 3 RCT
• Location • Number of participants • Older • Minority • With Co-morbidities	US >30,000 >7,000 (65+) >11,000 >5,000	Global >43,661 >17,000 (56+) >18,000 7,918	Global >23,000 7,660 (65+) 9,250 18,761	Global 44,325 13,610 (60+) 18,173* 8,173	UK:15,000 RSA: 4,400 4,050 (65+) 26-37%** 25%**	Russia 21,977 2,144 (60+) 295 922
Type of vaccine	mRNA	mRNA	ChAd	Ad26	Protein Subunit	Ad26/Ad5
Number of doses (interval)	2 (28 d apart)	2 (21 d apart)	2 (28 d apart)	1	2 (21 d apart)	2 (21 d apart)
Primary outcome determination	2 weeks after 2nd vaccination	1 week after 2nd vaccination	2 weeks after 2nd vaccination	4 weeks after vaccination	1 week after 2nd vaccination	3 weeks after 1st vaccination
Number COVID-19 at interim analysis	196	170	131	468	62	78
Efficacy	**94.5%**	**95%**	**82%**	**66%**	**89.3%**	**91.6%**
Severe COVID-19 cases and deaths	0 in vaccine 30 in placebo	1 in vaccine 9 in placebo	0 in vaccine Data not available for placebo	0 in vaccine Data not available for placebo	0 deaths in vaccine 5 deaths in placebo	0 in vaccine 20*** in placebo
Efficacy against severe COVID-19 cases	**100%**	**88.9%**	**100%**	**85%**	**100%**	**100%**
Most common severe adverse event	Fatigue (9.7%)	Fatigue (3.8%)	No SAE	Fever (9%)	Low level AEs	94% AE grade1
Storage temperature	2 to 8°C (1 mo)	2 to 8°C (5 d)	2 to 8°C (for 6 mo)	2-8°C (for 3 mo)	2 to 8°C (for 6 mo)	2 to 8°C (for 6 mo)
Efficacy against variants	Pre-clinical data shows six-fold reduction in neutralizing Ab's against 501Y.V2 variant	Pre-clinical data showed lower neutralization.	20% (RSA)	57% (RSA)	60% (RSA)	Data not available

Courtesy of Nadia Khan

Summary Document for Interim Clinical Considerations

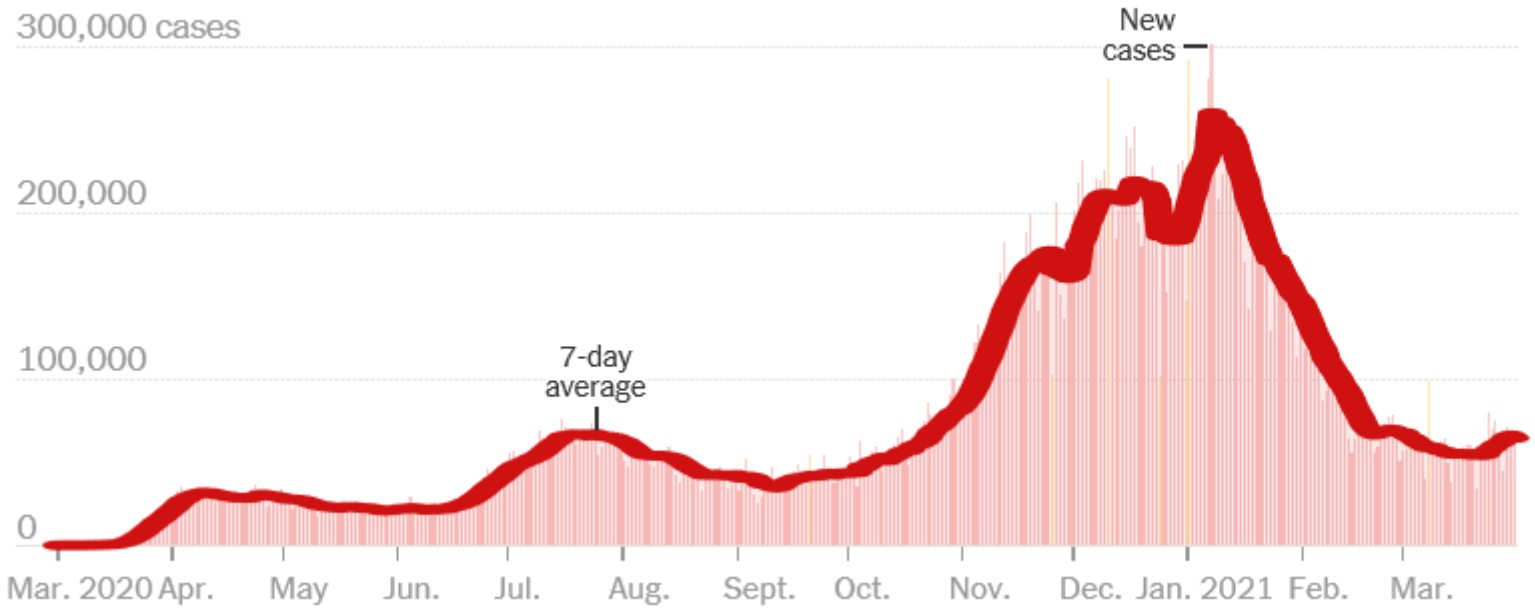
for Use of COVID-19 Vaccines Currently Authorized in the United States

	Pfizer-BioNTech	Moderna	Janssen
Vaccine type	mRNA	mRNA	Replication-Incompetent adenovirus type 26 vector
Authorized age groups	≥16 years	≥18 years	≥18 years
Dose	30 µg	100 µg	5×1010 viral particles
Dose volume	0.3 ml	0.5 ml	0.5 ml
Number of doses in series	2	2	1
Interval between doses	3 weeks (21 days)	1 month (28 days)	N/A

Interchangeability of Vaccines	▪ Vaccines are not interchangeable. However, in exceptional situations, such as a contraindication to a second dose of mRNA vaccine, interchangeability may be allowed.*
Interval between COVID-19 and other (non-COVID-19) vaccines	▪ 14 days. However, COVID-19 and other vaccines may be administered in a shorter period in urgent situations such as a tetanus-toxoid containing vaccine for after wound management, or to vaccinate residents of long-term care facilities to avoid delays to COVID-19 vaccination.
Persons with prior or current COVID-19	▪ COVID-19 vaccines can be given safely to people with prior SARS-CoV-2 infection ▪ Defer vaccination until person has recovered from the acute illness and criteria have been met for them to discontinue isolation ▪ While vaccine supply remains limited, persons may choose to temporarily delay vaccination due to low risk of reinfection in the months after initial infection
Persons who received monoclonal antibodies or convalescent plasma for COVID-19 treatment	▪ Defer vaccination for at least 90 days
Persons with a known SARS-CoV-2 exposure	▪ Persons in community or outpatient setting should defer vaccination until quarantine period has ended ▪ Residents or patients in congregate settings may be vaccinated if they do not have symptoms consistent with COVID-19

Persons with underlying conditions	▪ May receive COVID-19 vaccine (including persons with immunocompromising conditions; autoimmune conditions; and history of Guillain-Barré syndrome, Bell's palsy, and dermal filler use)
Pregnant or lactating people	▪ May choose to be vaccinated
Adolescents	▪ Adolescents aged 18 years and older are eligible for all COVID-19 vaccines ▪ Adolescents aged 16-17 are ONLY eligible for Pfizer-BioNTech COVID-19 vaccines
Contraindications	▪ Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to component of the COVID-19 vaccine ▪ Immediate allergic reaction of any severity to a previous dose or known (diagnosed) allergy to a component of the vaccine
Precaution	▪ Immediate allergic reaction to any other vaccine or injectable therapy (i.e., intramuscular, intravenous, or subcutaneous vaccines or therapies [excluding subcutaneous immunotherapy for allergies, i.e., "allergy shots"])
Post-vaccination observation periods	▪ **30 minutes:** persons with a precaution to vaccination (i.e., history of an immediate allergic reaction of any severity to a vaccine or injectable therapy) and persons with a history of anaphylaxis due to any cause ▪ **15 minutes:** all other persons
SARS-CoV-2 antibody testing	▪ Antibody testing not recommended for vaccine decision-making or to assess immunity following vaccination

Coronavirus in the U.S.:



New York Times April 1, 2021

COVID-19
Prevention Network

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The Amazing Team

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