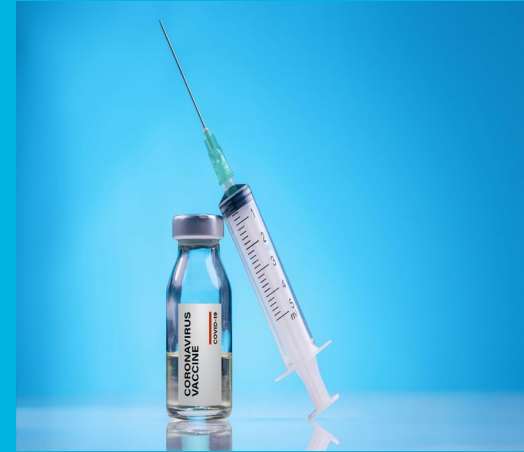




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COVID-19 Vaccinations: Where We Are and What We've Learned



Presented by:

Charles McPherson, PharmD

Clinical Assistant Professor, UIC College of Pharmacy
and

Brenikki Floyd, PhD, MPH

Clinical Assistant Professor, UIC School of Public Health

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By the Numbers

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United States COVID-19 Statistics

Updated May 11, 2021 @ 11:58pm EDT

POPULATION 330,756,000

CASES

32,773,387

TOTAL

9.91% PER CAPITA

DEATHS

582,791

TOTAL

0.176% PER CAPITA

NEW CASES

0

MAY 12

0% GROWTH

CASES PER DAY OVER TIME

United States — Linear Scale



Illinois COVID-19 Statistics

Updated May 11, 2021 @ 11:14pm EDT

[« Return to National Stats](#)

POPULATION **12,671,000** | POLICY **Reopening Regionally**

CASES

1,357,843

TOTAL

10.72% PER CAPITA

DEATHS

24,617

TOTAL

0.194% PER CAPITA

NEW CASES

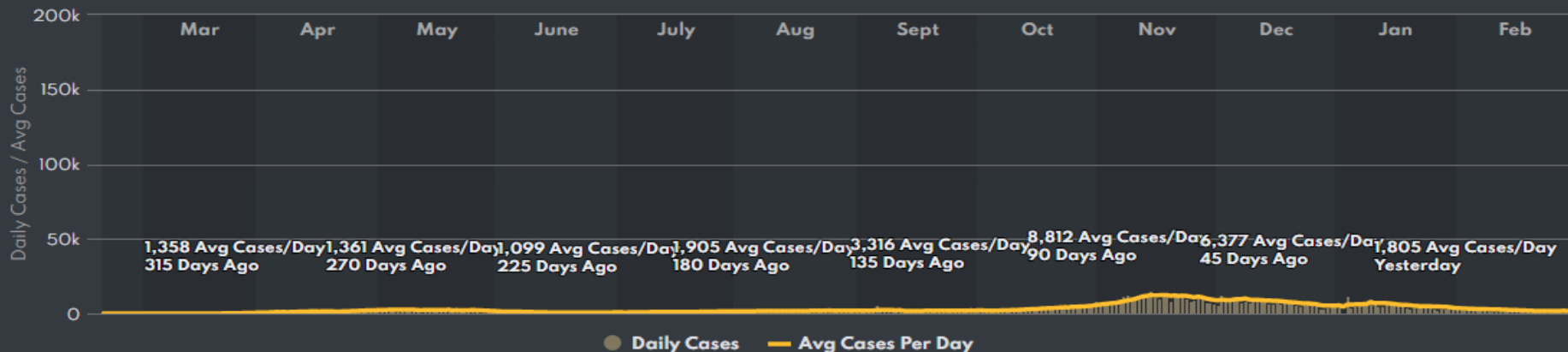
172,476

MAY 11

12.7% GROWTH

CASES PER DAY OVER TIME

Illinois — Linear Scale



State Level Stats

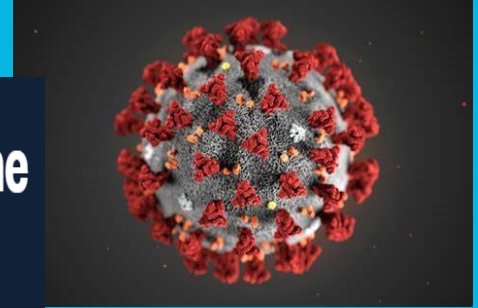
	TOTAL Cases	TOTAL Deaths	MORTALITY Rate	AVG CASES Per/Day	14-DAY Growth	AVG DEATHS Per/Day	AVG TESTS Per/Day	
California #1	3,760,846 9.5% pop	62,358 0.2% pop	1.7%	5,178	-46.59%	405	133,186 0.3% pop	VIEW »
Texas #2	2,919,621 10.1% pop	50,719 0.2% pop	1.7%	7,936	-25%	212	76,040 0.3% pop	VIEW »
Florida #3	2,275,365 10.6% pop	35,831 0.2% pop	1.6%	5,711	-19.06%	132	64,599 0.3% pop	VIEW »
New York #4	2,075,539 10.7% pop	52,770 0.2% pop	2.5%	7,230	-15.15%	114	227,768 1.2% pop	VIEW »
Illinois #5	1,357,843 10.7% pop	24,617 0.2% pop	1.8%	1,805	-20.1%	41	68,094 0.5% pop	VIEW »
Pennsylvania #6	1,178,083 9.2% pop	26,574 0.2% pop	2.3%	2,517	-26.14%	51	52,432 0.4% pop	VIEW »
Georgia #7	1,111,376 10.5% pop	20,391 0.2% pop	1.8%	2,920	-13.94%	79	18,827 0.2% pop	VIEW »
Ohio #8	1,085,733 9.3% pop	19,441 0.2% pop	1.8%	1,979	-27.62%	70	29,289 0.3% pop	VIEW »

National Vital Statistics System Release Provisional Mortality Data

Covid was third-leading cause of death in the U.S. last year



A CDC report confirms that only heart disease and cancer caused more deaths than Covid-19 in 2020.



Covid-19 was third leading cause of death last year, CDC confirms in early data



By [Jacqueline Howard](#), CNN

Updated 11:00 AM ET, Wed March 31, 2021



Actual Number of Deaths for the Leading Causes of Death, CDC 2015-20 (Provisional Data)

Cause of death	No. of deaths by year					
	2015	2016	2017	2018	2019	2020
Total deaths	2 712 630	2 744 248	2 813 503	2 839 205	2 854 838	3 358 814
Heart disease	633 842	635 260	647 457	655 381	659 041	690 882
Cancer	595 930	598 038	599 108	599 274	599 601	598 932
COVID-19 ^b						345 323
Unintentional injuries	146 571	161 374	169 936	167 127	173 040	192 176
Stroke	140 323	142 142	146 383	147 810	150 005	159 050
Chronic lower respiratory diseases	155 041	154 596	160 201	159 486	156 979	151 637
Alzheimer disease	110 561	116 103	121 404	122 019	121 499	133 382
Diabetes	79 535	80 058	83 564	84 946	87 647	101 106
Influenza and pneumonia	57 062	51 537	55 672	59 120	49 783	53 495
Kidney disease	49 959	50 046	50 633	51 386	51 565	52 260
Suicide	44 193	44 965	47 173	48 344	47 511	44 834

^a Leading causes are classified according to underlying cause and presented according to the number of deaths among US residents. For more information, see the article by Heron.⁴ Source: National Center for Health Statistics. National Vital Statistics System: mortality statistics (<http://www.cdc.gov/nchs/deaths.htm>). Data for 2015-2019 are final; data for 2020 are provisional.

^b Deaths with confirmed or presumed COVID-19, coded to *International Statistical Classification of Diseases and Related Health Problems, Tenth Revision* code U07.1 as the underlying cause of death.

Impact of COVID on 2020 U.S. Mortality Rates

- COVID resulted in 345,323 deaths
- Actual numbers likely underestimated
 - Underreporting of COVID-19
 - Limited testing at the beginning of pandemic
- COVID responsible for the increase in deaths from 2019-2020
- Increases seen with other leading causes likely due to disruptions in healthcare
 - Heart disease- 4.8%
 - Unintentional injury- 11.1%
 - Alzheimer's disease- 9.8%
 - Diabetes- 15.4%
- Increases in unintentional injury deaths due to drug overdose deaths



EXCLUSIVE

GOOD NEWS!

T

There, today, and in the
years to come, the
world will be a better
place because of the
good news that is
being shared with
you.

At the same time, the
world will be a better
place because of the
good news that is
being shared with
you.

And, in the years to
come, the world will
be a better place
because of the good
news that is being
shared with you.

For, in the years to
come, the world will
be a better place
because of the good
news that is being
shared with you.

And, in the years to
come, the world will
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news that is being
shared with you.

CDC: 35% of Americans Fully Vaccinated Against Coronavirus

- 35% of Americans are fully vaccinated
- 46% have received at least one dose
- 58% of adults have received one dose
- Biden's goal: 70% of adults with at least one shot by July 4th
- May 24th thru July 4th: Uber and Lyft to offer free rides



HEALTHY CHICAGO

CHICAGO WORKING FOR YOU



2 MILLION

COVID-19 VACCINE DOSES

have been administered in Chicago*

*As of April 27 Citywide

**PROTECT
CHICAGO**



- UI Health is utilizing Credit Union 1 Arena as a mass vaccination site
- UIC College of Pharmacy also a site
- As of May 7th, we've administered 102,000 doses
- University of Illinois Hospital has a robust vaccination process for hospitalized patients
- With the recent EUA of the Pfizer vaccine for children 12-15 years of age, we will add them to our inpatient protocol



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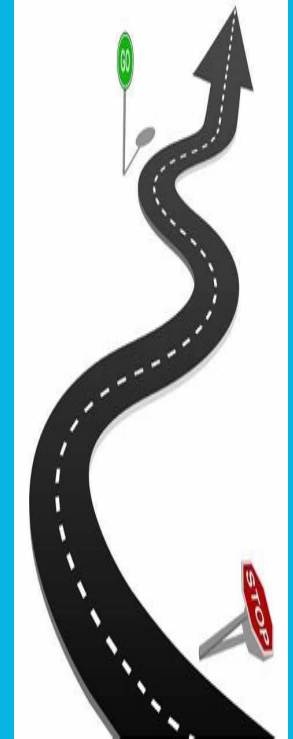
The COVID-19 Vaccines: How did we Get Here?

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Roadmap for Vaccine Development

- Vaccine development takes 10-15 years on average to develop
- Mumps Vaccine marketed in 1967 took 4 years to develop (fastest)
- HHS announces “Operation Warp Speed” on March 30th
 - Billions invested by US gov’t
 - Created requisite infrastructure
 - Guaranteed manufacturing of successful candidate
 - Pre-purchased allotments of vaccine
- Mortality rate: 1.8% for U.S. vs 3.6% for the World (WHO data)



Traditional Vector Vaccine Development

- Utilizes:
 - deactivated virus or
 - Live, attenuated virus grown in a culture to weaken it
- B cells in the body synthesize and store antibodies against surface proteins found on the viral capsule
- Host immune system mounts an adaptive response in the event we encounter a live version of the virus

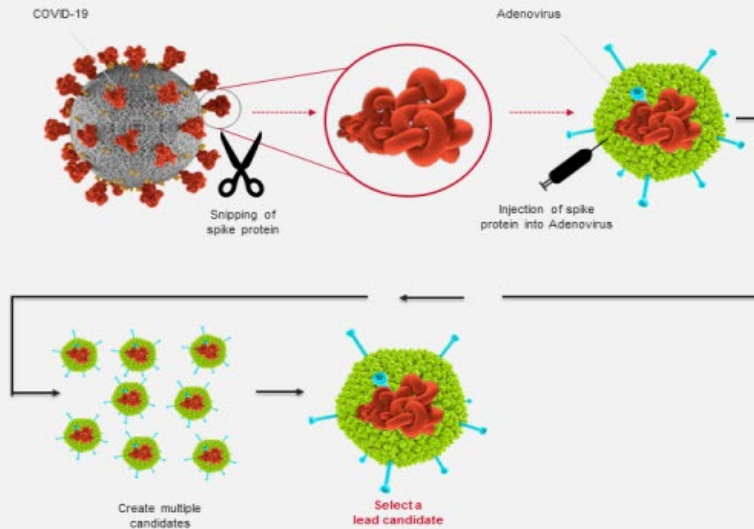


Traditional Vector Vaccine Development

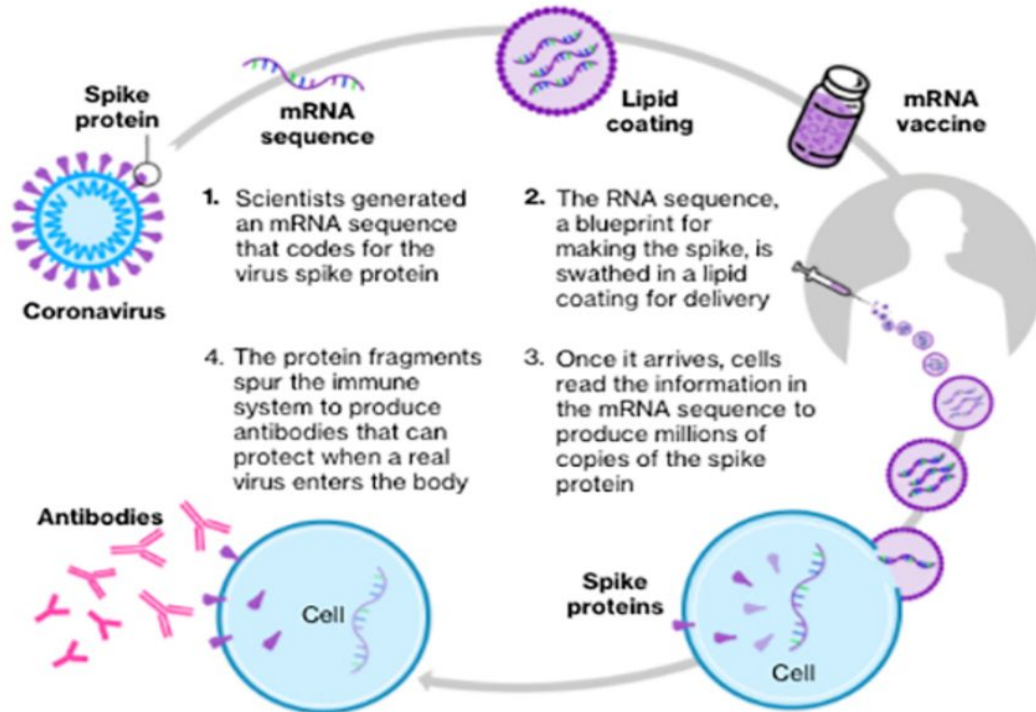
Designing a vaccine

January – March 2020

- **January 2020:** SARS-CoV-2 sequence available
- Vaccine design commences
- SARS-CoV-2 spike protein inserted into Ad26 vector
- Multiple vaccine candidates constructed
- **March 2020:** Validated with pre-clinical testing to identify lead candidate

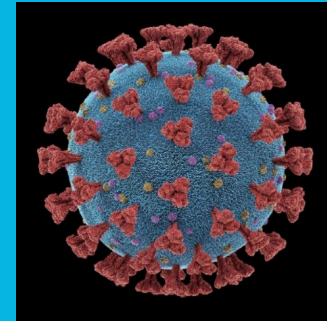


Messenger-RNA Vaccine Development



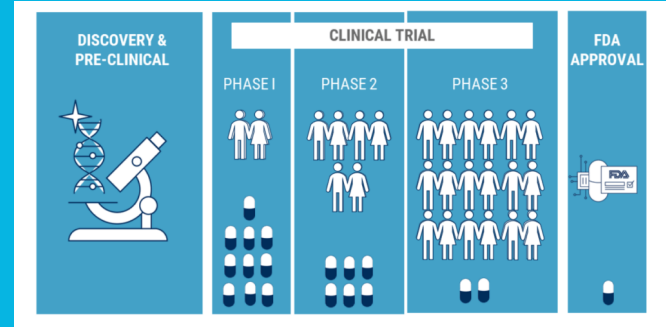
Messenger-RNA Vaccine Development

- Only two companies
- Utilizes:
 - mRNA technology
 - DOES NOT use altered whole or weakened virus
 - Encode a messenger RNA with the information to produce the SARS CoV-2 spike protein
 - Ribosomes inside our cells translate these mRNA's into an excretable version of spike protein
- Spike protein:
 - Abundant on the surface of SARS-Cov2 virus
 - Necessary to gain entry into host cells
 - Excellent target for memory B cells to produce antibodies against



Messenger-RNA Vaccine Development

- Phase I/II clinical trial data published
 - Moderna: July 14th, 20220
 - Pfizer: August 12th, 2020
 - Both proved effective in vaccinated animals
- Phase III
 - Pfizer:
 - 170 total confirmed COVID-19 cases: 8 in treatment arm
 - Efficacy rate: 95.3%
 - Moderna:
 - 196 total symptomatic confirmed COVID-19 cases: 11 in the treatment arm
 - Efficacy rate: 94.5%
 - Required hospitalization: 30/185 vs NONE





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How do the Vaccines Compare?

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COVID-19 Vaccine Comparison

COVID-19 vaccines: What you need to know

The U.S. now has three vaccines in its arsenal against the coronavirus. Here's how they compare.

	Johnson & Johnson	Pfizer	Moderna
Type of vaccine	Viral vector	RNA	RNA
How it works	Teaches the immune system to attack the protein the virus uses to infect other cells. The instructions are carried by a non-dangerous virus.	Uses RNA to teach the immune system to target the virus's surface, preventing infection.	Uses RNA to teach the immune system to target the virus's surface, preventing infection.
Effectiveness*	66%	95%	94.5%
Storage conditions	At least three months at refrigerator temperatures	Two weeks at freezer temperatures (-4°F), five days in the refrigerator (36° to 46°F)	One month at refrigerator temperatures
Doses needed per person	One shot	2 shots, three weeks apart	2 shots, four weeks apart
Status of availability	FDA authorized	FDA authorized	FDA authorized

*Note: The Johnson & Johnson vaccine was tested at a time when faster-spreading viral variants were common and in countries where these strains are known to exist.

Sources: Pfizer; Moderna; Johnson & Johnson; U.S. Food and Drug Administration; World Health Organization



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What are the COVID-19 Vaccine Ingredients?

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Vaccine Side Effects

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Description	Pfizer-BioNTech COVID-19 vaccine	Moderna COVID-19 vaccine
mRNA	Nucleoside-modified mRNA encoding the viral spike (S) glycoprotein of SARS-CoV-2	Nucleoside-modified mRNA encoding the viral spike (S) glycoprotein of SARS-CoV-2
Lipids	2[(polyethylene glycol)-2000]-N,N-ditetradecylacetamide	PEG2000-DMG: 1,2-dimyristoyl-rac-glycerol, methoxypolyethylene glycol
	1,2-distearoyl-sn-glycero-3-phosphocholine	1,2-distearoyl-sn-glycero-3-phosphocholine
	Cholesterol	Cholesterol
	(4-hydroxybutyl)azanediyl)bis(hexane-6,1-diyl)bis(2-hexyldecanoate)	SM-102: heptadecan-9-yl 8-((2-hydroxyethyl) (6-oxo-6-(undecyloxy) hexyl) amino) octanoate
Salts, sugars, buffers	Potassium chloride	Tromethamine
	Monobasic potassium phosphate	Tromethamine hydrochloride
	Sodium chloride	Acetic acid
	Dibasic sodium phosphate dihydrate	Sodium acetate
	Sucrose	Sucrose

* Neither vaccine contain eggs, gelatin, latex, or preservatives

Characteristic	Immediate allergic reactions (including anaphylaxis)	Vasovagal reaction	Vaccine side effects (local and systemic)
Timing after vaccination	Most occur within 15-30 minutes of vaccination	Most occur within 15 minutes	Median of 1 to 3 days after vaccination (with most occurring day after vaccination)
Signs and symptoms			
Constitutional	Feeling of impending doom	Feeling warm or cold	Fever, chills, fatigue
Cutaneous	Skin symptoms present in ~90% of people with anaphylaxis, including pruritus, urticaria, flushing, angioedema	Pallor, diaphoresis, clammy skin, sensation of facial warmth	Pain, erythema or swelling at injection site; lymphadenopathy in same arm as vaccination
Neurologic	Confusion, disorientation, dizziness, lightheadedness, weakness, loss of consciousness	Dizziness, lightheadedness, syncope (often after prodromal symptoms for a few seconds or minutes), weakness, changes in vision (such as spots of flickering lights, tunnel vision), changes in hearing	Headache

Characteristic	Immediate allergic reactions (including anaphylaxis)	Vasovagal reaction	Vaccine side effects (local and systemic)
Timing after vaccination	Most occur within 15-30 minutes of vaccination	Most occur within 15 minutes	Median of 1 to 3 days after vaccination (with most occurring day after vaccination)
Signs and symptoms			
Respiratory	Shortness of breath, wheezing, bronchospasm, stridor, hypoxia	Variable; if accompanied by anxiety, may have an elevated respiratory rate	N/A
Cardiovascular	Hypotension, tachycardia	Variable; may have hypotension or bradycardia during syncopal event	N/A
Gastrointestinal	Nausea, vomiting, abdominal cramps, diarrhea	Nausea, vomiting	Vomiting or diarrhea may occur
Musculoskeletal	N/A	N/A	Myalgia, arthralgia
Vaccine recommendations			
Recommended to receive 2nd dose of mRNA COVID-19 vaccine?	No	Yes	Yes



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COVID-19 Vaccines and Anaphylaxis

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CDC: Anaphylaxis Rate With COVID Vax 10 Times Greater Than for Flu Shots

— But events still rare and nonfatal, and benefits outweigh risks, officials say

by Molly Walker, Associate Editor, MedPage Today January 6, 2021



While rare, the rate of anaphylaxis following COVID-19 mRNA vaccines appeared about 10 times that documented for flu shots, CDC officials said on Wednesday.

Overall, 21 cases of anaphylaxis following COVID vaccination were reported out of about 1.9 million doses given as of Dec. 23, according to an early *Morbidity and Mortality Weekly Report* release. That amounts to 11.1 cases per million versus an estimated 1.3 cases per million following inactivated influenza vaccine, agency officials said on a call with the media.



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What about Vaccine Induced Thrombotic Thrombocytopenia?

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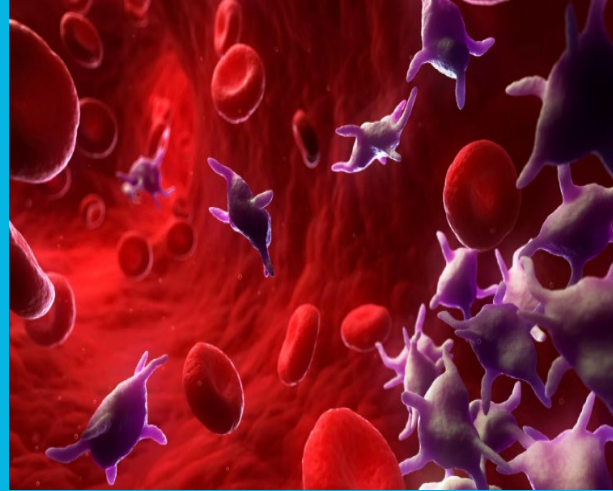
Blood Clots and the Johnson & Johnson Vaccine: What We Know So Far

Infectious disease physician-scientist Wilbur Chen discusses the rare cases of blood clots linked to the immunization

By Jim Daley on April 23, 2021

Vaccine-Induced Immune Thrombotic Thrombocytopenia

- Also known as VITT
- Seen with viral vector vaccines
 - Astra-Zeneca
 - Johnson & Johnson
- Characterized by immune-mediated platelets and clotting
- Incidence: 1 in 100,000 for J&J
 - 6 cases out of 6.8 million doses administered
 - All were women
 - One woman died





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How long do the COVID vaccines provide protection?

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Pfizer Says Its COVID Vaccine Remains Highly Effective For At Least 6 Months After 2nd Dose

By Dr. Mallika Marshall April 1, 2021 at 5:33 pm Filed Under: Coronavirus, Coronavirus Vaccine, Dr. Mallika Marshall

REUTERS

Moderna says protection from its COVID-19 vaccine still strong six months on



FILE PHOTO: A nurse draws a Moderna coronavirus disease (COVID-19) vaccine, at East Valley Community Health Center in La Puente

f

Michael Erman

April 13, 2021 · 2 min read



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Are the COVID Vaccines effective against variant strains?

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Early study suggests Pfizer vaccine effective against coronavirus mutations

cdavis@insider.com (Charles Davis) · 4 days ago





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Will we need a 3rd dose?

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HEALTH AND SCIENCE

Pfizer CEO says third Covid vaccine dose likely needed within 12 months

PUBLISHED THU, APR 15 2021-1:23 PM EDT | UPDATED THU, APR 15 2021-3:13 PM EDT



Berkeley Lovelace Jr.
@BERKELEYJR

SHARE



Will Moderna COVID vaccine need a third dose? Here's what we know so far

BY [KATIE CAMERO](#)

APRIL 23, 2021 10:15 AM, UPDATED APRIL 24, 2021 11:08 AM



There are three COVID-19 vaccines authorized for emergency use in the U.S.: Pfizer-BioNTech, Moderna and Johnson & Johnson. All three prevent severe disease and death but there are some differences on how each vaccine works. Here's what to know. BY [DANIEL A. VARELA](#) | [MICHELLE MARCHANTE](#)

Another Vaccine Booster? Possibly

- 76 million Americans fully vaccinated
- Vaccines currently indicated for everyone 16 years and older
- With some vaccines (e.g. polio), one dose is enough
- With others (e.g. flu vaccine), must receive dose annually
- Pfizer began new trial in February of 2021 to test whether a booster is necessary after 6-12 months; Moderna announces booster development plans also
- Rationale for a booster:
 - 1) 5,800 cases of COVID from fully vaccinated persons
 - 2) Increase titers of neutralizing antibodies
 - 3) Incorporate protection against variants
 - B.1.1.7 (UK)
 - B.1.351 (South Africa)
 - P.1 (Brazil)



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New CDC COVID-19 Vaccine Recommendations



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Age

- On April 21st, Biden announced that everyone over 16 is eligible for a COVID-19 vaccine
- This week, the FDA authorized the use of the vaccines for 12-15 year olds
- Pfizer and Moderna currently conducting trials children as young as 6 months old

Pfizer's COVID-19 vaccine for children 12 to 15 may be FDA approved this week

Mon, May 3, 2021, 4:28 PM

yahoo!news



abcNEWS

Children as young as 6 months old now in COVID-19 vaccine trials

6 days ago



Pregnancy

HEALTH AND SCIENCE

CDC recommends pregnant women get Covid vaccine after study shows it's safe for mother and baby



PUBLISHED FRI, APR 23 2021-4:44 PM EDT | UPDATED FRI, APR 23 2021-6:52 PM EDT

- On April 27th, the CDC released statement about “growing evidence” confirming safety of COVID vaccines during pregnancy
- January 28th issue of Obstetrics and Gynecology: “Helpful antibodies” found in cord blood
 - 99% of babies after mother received 2 doses
 - 44% of babies who’s mothers received 1 dose

MAY 3, 2021

COVID vaccination in pregnancy may pass helpful antibodies to baby



Here's reassuring news for moms-to-be: Pregnant women who receive the Pfizer-BioNTech or Moderna COVID-19 vaccines appear to transfer protective antibodies to their babies, a new study says.



Questions