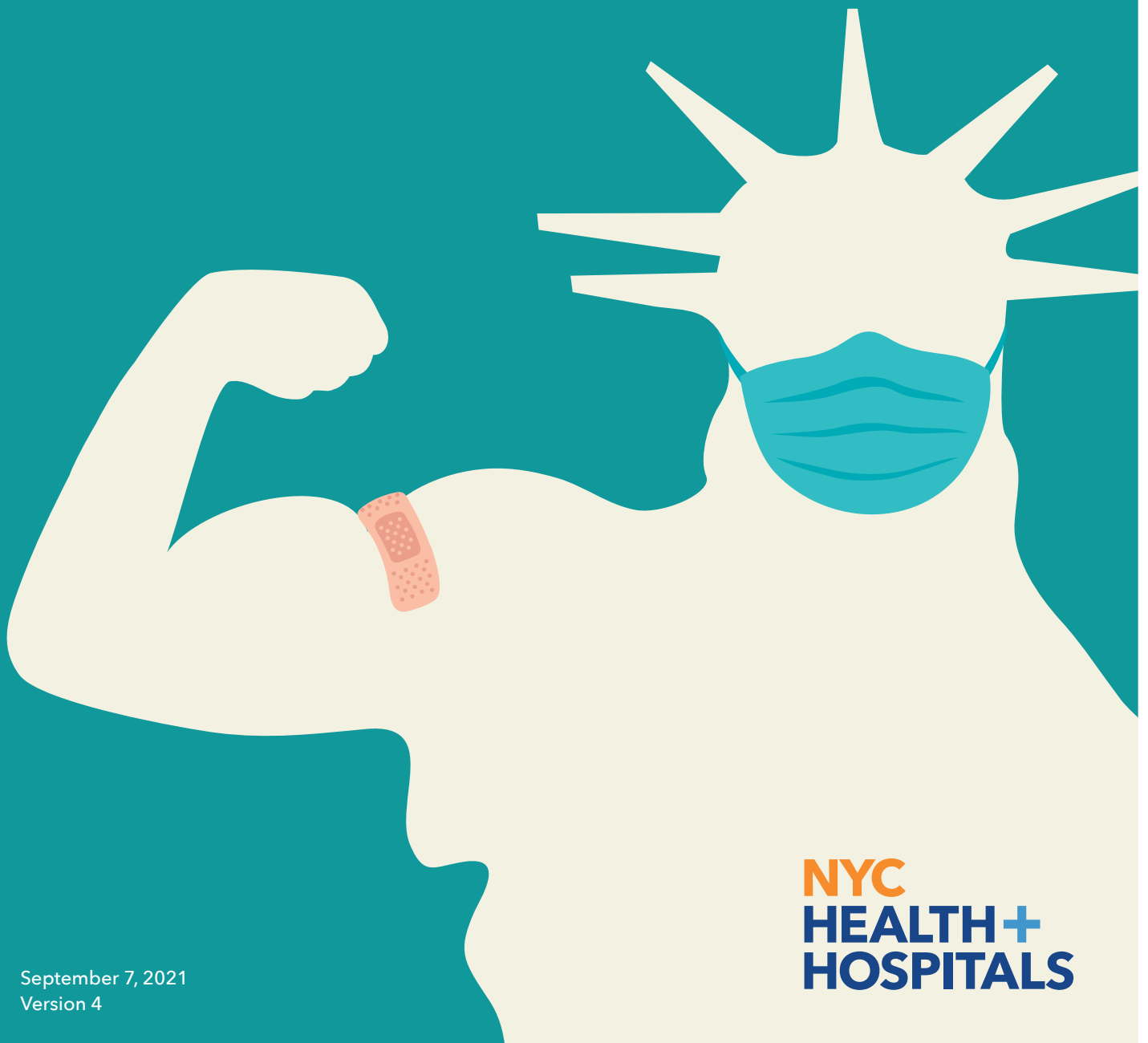# Understanding COVID-19 Vaccines

A guide to learning about COVID-19 vaccines

September 7, 2021
Version 4

**NYC
HEALTH+
HOSPITALS**

About This Guide

This guide shares information about vaccination and COVID-19 vaccines, to help answer your questions and address your concerns. You will find information to help keep you, your family and community safe. You will be able to use what you learn and be empowered to make decisions that work for **YOU**. You have a voice, and can also share this knowledge with your loved ones, on social media, or in your community.

A Glance at What's Inside

Section 1

Understanding Vaccination and Immunity

The Importance of Vaccination

✚ COVID-19 vaccination is a safe way to help the immune system build protection against COVID-19.

✚ **Getting vaccinated reduces the risk of severe disease, hospitalization and death.**

✚ Getting vaccinated in addition to practicing public health precautions is a great way to provide protection against the virus.

✚ Vaccination helps with community immunity, or herd immunity, which will reduce the spread of disease.

✚ **The more people who get vaccinated, the sooner we can end the pandemic.**

How Herd Immunity Works
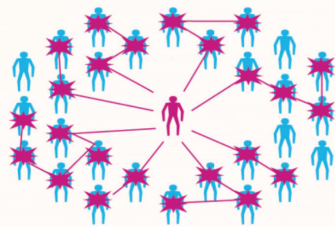
When no one has immunity, contagion has many opportunities to spread quickly.
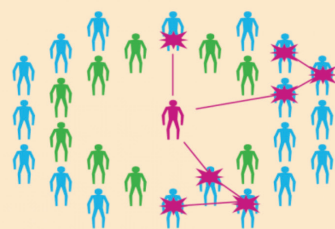
The more immunity we have in the system, the less often contagion* comes into contact with the susceptible.

Spread of contagious disease is contained.

www.ucdavis.edu/sites/default/files/2020/herd_immunity_3.png

*Contagion is another way of referring to a virus.

How Do Vaccines Work?

+ When germs, such as the virus that causes COVID-19, invade our bodies, they attack and multiply. This causes infection and illness.

+ Our immune system uses several tools to fight infection, such as antibodies and specific immune cells called B and T lymphocytes.

+ Vaccines are used to help the immune system create immune cells and antibodies in order to prevent illness.

+ After vaccination, the body is left with a supply of "memory" cells and **antibodies that will recognize and remember how to fight specific germs in the future.**

+ Like many other vaccines, some of the COVID-19 vaccines require multiple doses to build protection.

Natural Immunity vs. Vaccine Induced Immunity

The immunity someone gains from having an infection, called natural immunity, varies from person to person. We are still learning about how long someone can be protected after recovering from COVID-19.

Vaccination is important even if you already had COVID-19 infection, because:

+ Re-infection with COVID-19 is possible.
+ Research is ongoing to find out how long immunity lasts.
+ Vaccination provides strong immunity.

What are mRNA Vaccines?

+ Pfizer BioNTech (Comirnaty) and Moderna COVID-19 vaccines are messenger RNA (mRNA) vaccines.

+ mRNA vaccines teach cells how to make a **harmless piece of the spike protein**, which is found on the surface of the COVID-19 virus.

+ This protein then triggers an immune response to make antibodies that protect against COVID-19.

+ **After our cells make copies of the protein, they destroy the mRNA from the vaccine.**

+ **mRNA does not enter the nucleus of your cells where DNA is stored and does NOT affect your DNA.**

HOW MRNA COVID-19 VACCINES WORK
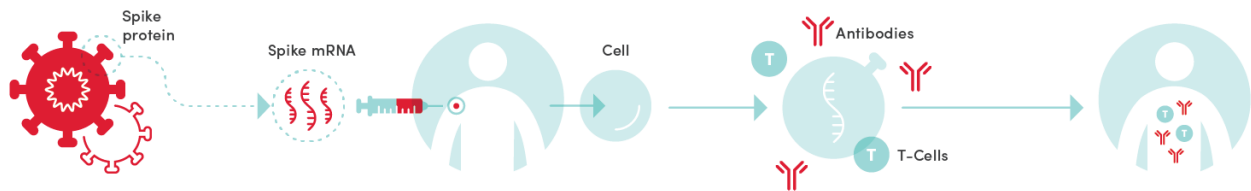
Spike protein · Spike mRNA · Cell · Antibodies · T · T-Cells

What are Adenovirus Vector Vaccines?

✚ Adenoviruses are common viruses that typically cause colds or flu-like symptoms.

✚ The Janssen COVID-19 vaccine is a modified harmless adenovirus. It contains the gene for the coronavirus spike protein that enters the cell, but can't make copies or cause illness. It only produces the coronavirus spike protein.

✚ The immune system will then respond to the spike protein, which allows it to recognize and fight off a future infection by the virus.

HOW ADENOVIRUS VECTOR VACCINES WORK

COVID-19 virus · Spike protein

Spike protein gene is added to modified adenovirus

Harmless modified adenovirus enters cell nucleus

Cell produces spike proteins

Immune system produces antibodies and immune cells
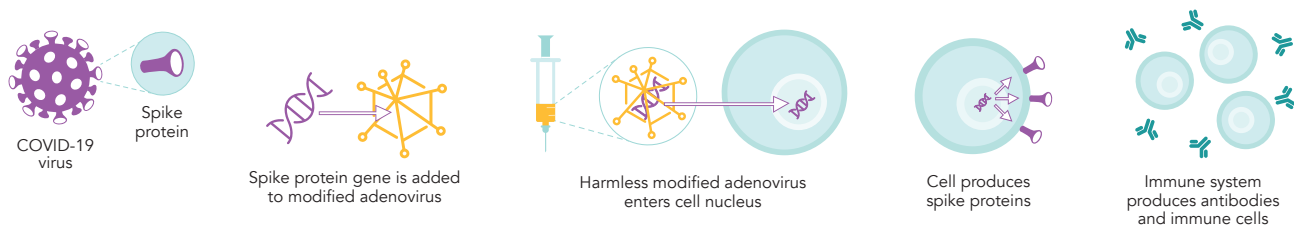
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Facts on Adolescents and COVID-19 Vaccination

+ Adolescents are at risk for COVID-19 infection, severe illness, hospitalization, and death, and represent an increasing proportion of recent COVID-19 cases.

+ Adolescents who get infected with COVID-19 may also indirectly impact others' health, including older vulnerable populations, and contribute to transmission in households and communities.

+ The two dose Pfizer BioNTech COVID-19 Vaccine (Comirnaty) series for adolescents, aged 12-15, is safe and has gone through the same stringent and rigorous process for authorization.

+ Vaccinated adolescents generate a robust antibody response and side effects from the vaccine are well tolerated.

Facts on Pregnancy and COVID-19 Vaccination

+ Pregnancy causes changes in the body that could increase the risk for developing severe COVID-19 illness, hospitalization, and poor pregnancy outcomes.

+ COVID-19 vaccination during pregnancy reduces the risk of infection and hospitalization. Antibodies made after a pregnant person is vaccinated may also help protect newborns against COVID-19.

+ There is currently no evidence that the COVID-19 vaccines cause fertility problems.

+ The American College of Obstetricians and Gynecologists, the Society for Maternal Fetal Medicine and the CDC recommend vaccination for people who are pregnant, breastfeeding, or might become pregnant in the future.

Read more here:
cdc.gov/coronavirus/2019-ncov/need-extra-precautions/pregnant-people.html#anchor_1614967211600

COVID-19 Variants

✚ Viruses can change through mutations. These mutated forms of a virus are called variants.

✚ Multiple variants of the virus that causes COVID-19 are circulating globally. Scientists monitor all variants but may classify certain ones as variants of interest, concern, or high consequence based on how easily they spread, how severe their symptoms are, and how they are treated.

Some variants seem to spread more easily and quickly than other variants, which may lead to more cases of COVID-19.

✚ **Current COVID-19 vaccines from Moderna, Pfizer BioNTech, and Janssen offer protection against these variants, including prevention from severe illness and hospitalization.**

✚ **Getting vaccinated prevents continued community spread and the introduction of new variants.**

Circulating Variants of Concern

Name	First Identified	Transmission	Disease Severity	Treatment
Alpha *B.1.1.7*	United Kingdom	• Spreads much faster than other variants	• Hospitalizations and case fatality data show increased severity, and may cause more people to get sicker and to die.	• Treatments are effective against this variant.
Beta *B.1.351*	South Africa	• May spread faster than other variants.	• Current data do not indicate more severe illness or death than other variants.	• Certain monoclonal antibody treatments are less effective against this variant
Gamma *P.1*	Japan/ Brazil	• Spreads faster than some other variants	• Current data do not indicate more severe illness or death than other variants.	• Certain monoclonal antibody treatments are less effective against this variant.
Delta *B.1.617.2*	India	• Highly contagious and spreads much faster than other variants. • Fully vaccinated people who do become infected can spread the virus to others.	• May cause more severe cases than the other variants.	• Certain monoclonal antibody treatments are less effective against this variant.

Read more here:
cdc.gov/coronavirus/2019-ncov/variants/variant.html
cdc.gov/coronavirus/2019-ncov/variants/variant-info.html

Additional Vaccine Dose

There are two distinct potential uses for an additional vaccine dose:

✚ **Additional dose after an initial primary vaccine series when the initial immune response is likely to be insufficient.**

Some immunocompromised people don't always build the same level of immunity after vaccination as others do. Fully vaccinated immunocompromised people have accounted for a large proportion of hospitalized breakthrough cases and are more at risk for serious, prolonged illness.

People with moderately to severely compromised immune systems should receive an additional dose of mRNA COVID-19 vaccine after the initial 2 doses. This includes people who have:

- Been receiving cancer treatment (such as chemotherapy)
- Been receiving an organ transplant and are taking medicine to suppress the immune system
- Received a stem cell transplant within the last 2 years or are taking medicine to suppress the immune system
- Have another cause of moderate or severe immunodeficiency (genetic syndromes)
- Advanced or untreated HIV infection
- Active treatment drugs that may suppress the immune response

✚ **A booster dose when the initial sufficient immune response to a primary vaccine series is likely to have waned over time.**

Booster doses for all individuals may be available in the near future.

Read more here: cdc.gov/coronavirus/2019-ncov/vaccines/recommendations/specific-groups.html

Section 2

Vaccine Development, Safety, and Efficacy

Accelerated Vaccine Production

It is normal to have questions about the quick development of COVID-19 vaccines, since vaccines usually take years to be developed. There were many factors that led to quicker vaccine production:

A HEAD START

Scientists learned from previous research on viruses similar to COVID-19 (like MERS and SARS). mRNA technology has been studied for over a decade, paving the way for efficient development of mRNA vaccines.

Adenovirus-based vaccines have been studied for years Recently, an adenovirus-based vaccine for Ebola was approved for general use.

COUNTRIES WORKING TOGETHER FOR A COMMON GOAL

Existing knowledge around vaccine technology and **continuous information sharing by researchers around the world allowed scientists to study and create effective vaccines.**

INVESTMENTS

Developing a vaccine usually can take years to raise money, but due to the high demand for a COVID-19 vaccine, **the US Congress gave over $12 billion to fund vaccine research and development.**

OVERLAPPING PHASES OF VACCINE DEVELOPMENT

Vaccine development is typically done in a step by step process. **To speed up the process, many steps were done simultaneously in an efficient and coordinated manner.**

Traditional Vaccine Development – Multiple Years

Large-scale Production

Pre-clinical Development

Clinical Development

Licensure

Phase 1   Phase 2   Phase 3

Pandemic Vaccine Development Model – Overlapping Phases

Large-scale Production

Pre-clinical Development

Clinical Development

Licensure

Phase 1   Phases 2 & 3   Regulatory Pathway
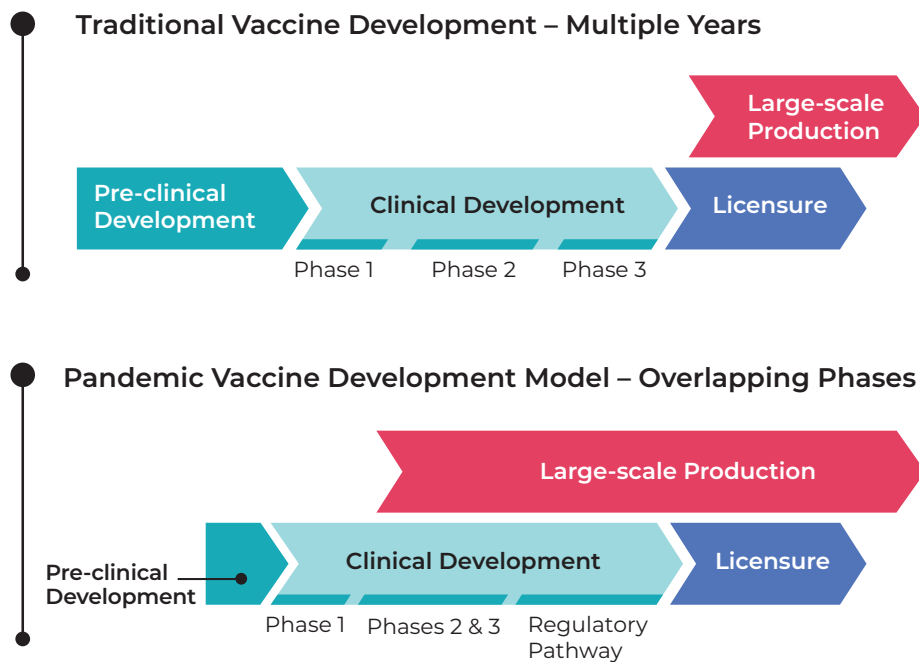
EFFICIENT CLINICAL TRIALS

COVID-19 vaccines have gone through the same **rigorous safety assessments** and clinical trial phases as other vaccines.

No steps were skipped during these processes.

Diversity in Clinical Trials

+ Current authorized vaccines were tested in diverse populations, including communities of color.

+ Clinical trials showed high levels of safety and efficacy among tens of thousands of people across all age groups, genders, races, and ethnicities including:

  - Hispanic/Latino
  - American Indian or Alaska Native
  - Black
  - White
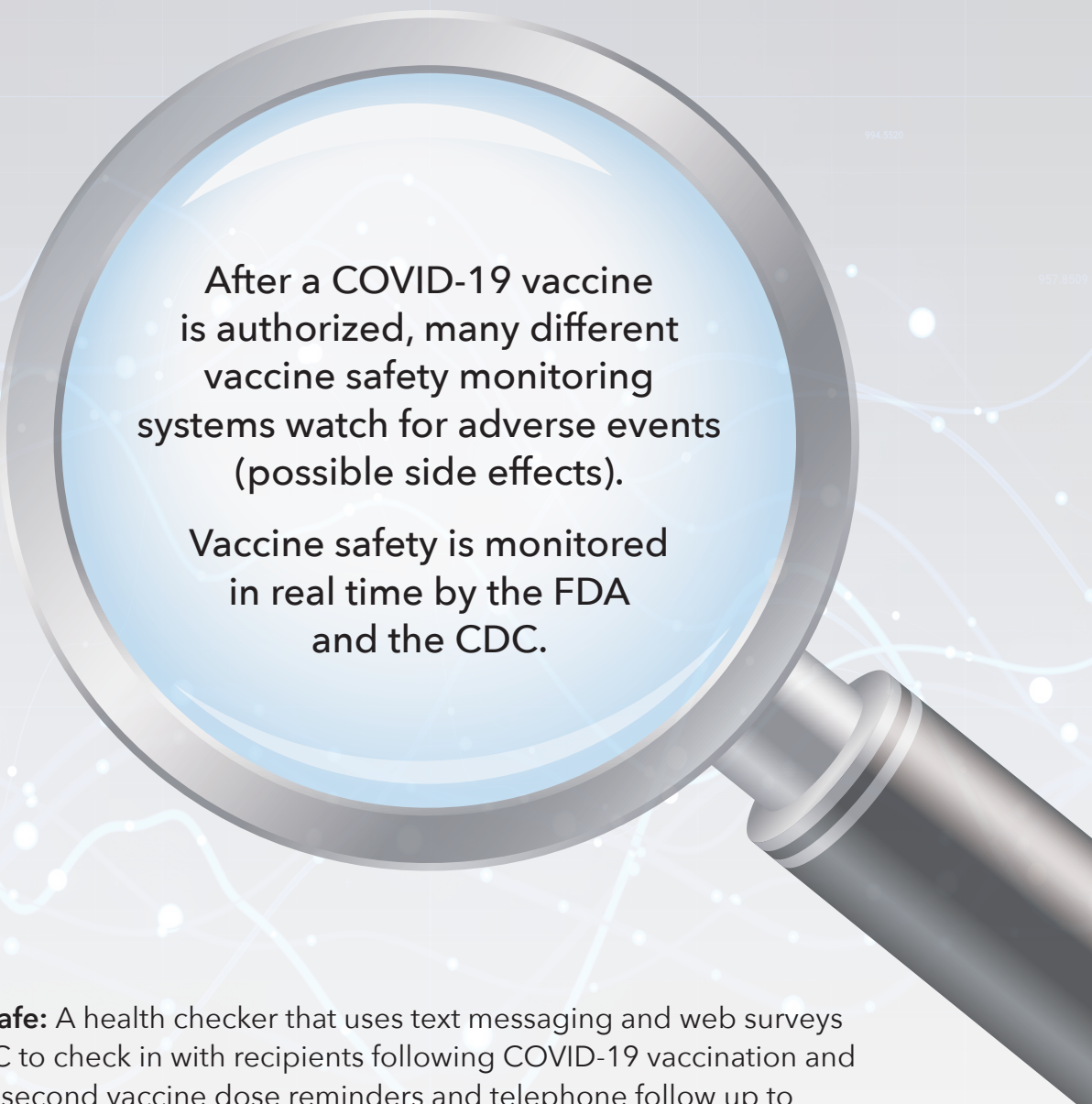 - Native Hawaiian or other Pacific Islander
  - Asian

Emergency Use Authorization of Vaccines and Approval of COVID-19 Vaccines

✚ Emergency Use Authorization (EUA) allows new medicines or vaccines that treat or prevent serious or life-threatening diseases to be made available quickly to the public during an emergency, once the best available evidence from clinical trials has been carefully reviewed.

✚ Safety testing and clinical trials were not fast tracked. The Food and Drug Administration (FDA) and Centers for Disease Control (CDC) focused on review and authorization, making the vaccine their number one priority.

✚ Approval means the FDA has thoroughly evaluated extensive data and information from the EUA, such as pre-clinical and clinical data, the manufacturing process, and vaccine testing results to ensure vaccine quality, safety, and effectiveness.

After a COVID-19 vaccine is authorized, many different vaccine safety monitoring systems watch for adverse events (possible side effects).

Vaccine safety is monitored in real time by the FDA and the CDC.

+ **CDC: V-safe:** A health checker that uses text messaging and web surveys from CDC to check in with recipients following COVID-19 vaccination and provides second vaccine dose reminders and telephone follow up to anyone who reports medically significant adverse events.

+ **CDC and FDA: Vaccine Adverse Event Reporting System (VAERS)** A national vaccine safety surveillance system that collects, monitors, and tracks reports from healthcare professionals, vaccine manufacturers, and the public on adverse events that happen after vaccination.

+ Other monitoring systems include the **National Healthcare Safety Network (NHSN), the Food and Drug Administration (FDA), and CDC Vaccine Safety Datalink (VSD).**

Side Effects

+ Common short term side effects are normal after vaccination and mean your body is in the process of building protection. So far, millions of people have been vaccinated and major side effects are extremely rare.

+ **Experiencing side effects after you get vaccinated is common and does not mean that you're infected with COVID-19 from the vaccine. Some people experience short-term side effects, while others don't. Either way, your body is still working to build protection against COVID-19.**

+ Speak with your doctor if you have a history of allergic reactions or have further questions about side effects.
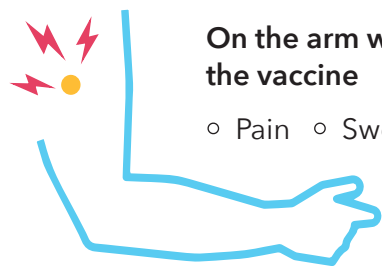
On the arm where you got the vaccine

○ Pain ○ Swelling

Throughout the rest of your body

○ Fever
○ Tiredness
○ Chills
○ Headache

Rare Adverse Events

Janssen COVID-19 Vaccine: There are rare but increased risks of **Guillain-Barré syndrome (GBS)** and **thrombosis with thrombocytopenia syndrome (TTS)** following the use of the Janssen vaccine. GBS is a rare disorder that causes muscle weakness and sometimes paralysis which may occur during the 42 days following vaccination. Most people fully recover. TTS is a rare condition which involves blood clots with low platelets. Women, especially those younger than 50 years old, should be aware of the rare but increased risk of TTS.

Moderna and Pfizer-BioNTech (Comirnaty) Vaccines: There is a rare but increased risk of **myocarditis** (inflammation of the heart muscle) and **pericarditis** (inflammation of the outer lining of the heart), following the use of the Pfizer-BioNTech and Moderna mRNA vaccines, particularly in male adolescents and young adults above the age of 16 in the days immediately following the second dose of mRNA COVID-19 vaccines. These conditions are rare, given the hundreds of millions of vaccine doses already administered. Individuals can usually return to their normal daily activities after their symptoms improve.

These adverse events are extremely rare and the CDC and FDA continue to monitor the safety of all vaccines. The significant benefits of vaccination, such as prevention of COVID-19 disease, severe illness, and hospitalization, outweigh the risks associated with these rare adverse events.

Section 3

Safety Tips and Resources

✛ **Your actions matter. Simple strategies, like wearing a face covering, maintaining physical distance from others, keeping hands clean, and staying home if sick, will help slow the spread of COVID-19.**

✛ Fully vaccinated individuals should still continue to take precautions, such as wearing masks when in low-vaccination, high-transmission settings or during certain activities that could be at high risk for transmission.

✛ Getting vaccinated and practicing safety precautions can help increase community protection and reduce the spread of variants.

Read more here: cdc.gov/coronavirus/2019-ncov/vaccines/fully-vaccinated-guidance.html

Keeping Safe and Protecting Yourself and Others from COVID19

Layer each measure on! The more you add to your pile of prevention, the lower your risk of COVID19 infection

Stay Home If You Can	Wear a Mask	Stay Distant	Avoid 3'Cs:	Open Windows	Clean Hands and High Touched Surfaces
Limit contact and activities with non-household contacts Avoid close contact with people who are sick	Select a high-quality mask with multi-layers, a good fit, and filtration Wear a mask in indoor and outdoor settings when around other people Wear a mask correctly (over your nose and mouth) and consistently	Stay at least 6 feet from non-household contacts but the more distance the better. Limit duration and time spent when around others	Avoid crowded places, close contact settings, confined, enclosed spaces	Increase ventilation and airflow by opening windows and doors if possible	Clean hands often and especially after touching any high touch surfaces, contaminated items, after being in a public space and before touching your face Clean and disinfect high touch surfaces daily or more if contaminated

Stay Informed	Get Tested Periodically	Get Vaccinated When Eligible	Monitor Your Health	Practice Respiratory Etiquette
Stay up-to-date on local COVID19 news including rate of community transmission, and public health announcements If you get a call from a contact tracer or public health department, pick up the phone See your local health department website among other credible sources of information	If you engage in activity requiring in-person contact outside your home or live or work in a congregate setting, you should get tested at least once a month (regardless of exposure or symptoms) There are several types of COVID19 tests, some more reliable than others. Talk to your health care provider about which type of test is best for you based on reason for testing	Get the COVID19 vaccine when eligible and if you meet the criteria for vaccination Ensure you follow vaccination schedule (2 dose) depending on vaccine received for full protection	Be alert for symptoms of COVID19 or any new or concerning symptoms especially if you engage in activities or settings with other people	Always practice respiratory etiquette, cover your coughs and sneezes and wash or sanitizer your hands

www.belfercenter.org/publication/keeping-safe-and-protecting-yourself-and-others-covid19

Trusted Sources for Information

Learning about COVID-19 vaccines can be overwhelming.

It is important to use scientific sources to check the facts about vaccines in order to avoid false or misleading information.

A few trusted sources you can use are:

+ **NYC Health + Hospitals**
nychealthandhospitals.org/covidvaccine
ess.nychhc.org/vaccinationinformation.html

+ **NYC Department of Health and Mental Hygiene**
nyc.gov/covidvaccine

+ **New York State Department of Health**
covid19vaccine.health.ny.gov

+ **CDC**
cdc.gov/covidvaccine

+ **FDA**
fda.gov/emergency-preparedness-and-response/coronavirus-disease-2019-covid-19/covid-19-vaccines

Messages From Trusted Voices

"Just like wearing a mask, I'd never advise you to do something that I wasn't willing to do myself. You should still get the vaccine even if you already got COVID before/have COVID antibodies.

This is because we don't know how long natural immunity lasts (some studies suggest people may get it twice) and the vaccine can not only extend your immunity, but also make your immunity stronger."

– Alexandria Ocasio-Cortez
US Representative – New York

"I understand you know historically—everything dating back all the way to the Tuskegee experiments and so forth – why the African American community, would have some skepticism. But the fact of the matter is, is that vaccines are why we don't have polio anymore. And they're the reason why we don't have a whole bunch of kids dying from measles and smallpox and diseases that used to decimate entire populations and communities.

If Anthony Fauci tells me this vaccine is safe, and can vaccinate, you know, immunize you from getting COVID, absolutely I'm going to take it."

– Former President Barack Obama

"COVID-19 is disproportionately impacting Black Americans, and generational trauma has led to massive distrust of vaccines.

The [COVID Collaborative] national education campaign will be a critical step in providing Black communities with the information they need to rebuild trust and get vaccinated."

– Derrick Johnson
President of the NAACP

"We know that our collective role in helping to create a vaccine that works for black people – and that we trust—has an impact on our very survival."

– America's Black doctors and nurses & the Black Coalition against COVID-19

"I got the COVID vaccine to protect myself, my family, my patients, and my community. The sooner we can all get vaccinated, the sooner we can all together return to normal life!"

— Celine Gounder, MD
Former member of the Biden-Harris Transition
COVID-19 Advisory Board

"As a Pediatrician and Director of Equity, Quality & Safety at NYC H+H, I believe strongly that vaccines are safe, effective and are the most promising path forward to regaining our humanity and putting this devastating pandemic behind us forever. The medical evidence shows that the approved COVID vaccines are safe and work well in all people, something that can truly unite us in the fight against this virus. Therefore, we all have to do our part to get vaccinated to protect ourselves, our families, and our communities so we can all emerge on the other side of this stronger together!"

— Louis H. Hart III, MD
Director of Equity, Quality & Safety

"New York City has gotten through this pandemic by standing in solidarity with mask wearing, social distancing, and testing – getting your vaccine is the final step in keeping your family, community, and city safe."

Theodore Long, MD, MHS
Senior Vice President, Ambulatory Care and
Population Health

"The COVID vaccine is one powerful tool that we have to protect ourselves and each other from COVID. The reality of vaccine acceptance among the community is complex. The responsibility of making the experience safe and trusting are responsibilities that we share as a community."

Khoi Luong, MD
Post-Acute Chief Medical Officer

حمي نفسك عائلتك
وأحبابك، تلقح ضد الكورونا، الوقاية خيرمن العلاج

— Rabea Khedimi, MD
Infectious Disease Physician

"As nurses, we all understand the critical importance of preventative medicine, and today, we have one of the most important tools available to us to help prevent the continuing spread of COVID-19: a safe and effective vaccine. Getting the COVID-19 vaccine yourself, and encouraging others to get vaccinated, is the best way to protect yourself and the people around you. Stopping a pandemic requires using every available resource…so we are all able to connect face to face again."

— Natalia Cineas, DNP, RN, NEA-BC
Chief Nurse Executive

我已经接受COVID疫苗的两次注射。我在此希望大家为了自己家人，身边亲朋好友及社区人群的健康，积极参与接种疫苗的活动。

— Christopher Ding, MD
Emergency Medicine Resident

"Me vacune para proteger a mi familia, amigos, y pacientes. La vacuna es segura, y nos ayudara volver a la normalidad."

Leonel Lopez III, MD, MHS
Director, Equity and Evaluation, Office of
Ambulatory Care and Population Health

کووبڈ 19 ویکسین بمارے جسم کو بیماری سے لڑنے میں مدد دیتی ہے
اور بمیں کووبڈ 19 وائرس سے محفوظ رکھتی ہے

Syra Madad, DHSc, MSc
Senior Director, System-wide
Special Pathogens Program

"I can understand the concerns about a new vaccine, but when you look at what we know about COVID – how devastating an illness it is, the deaths and the long-term consequences that we are still learning about, and you compare that to the science of the vaccine and how well they work at preventing severe sickness and death from COVID, for me it was a clear choice. I am vaccinated, and I feel a bit more at ease knowing that many of my family members are also vaccinated."

— Nichola Davis, MD, MS
Vice President and Chief Population Health
Officer, Office of Population Health

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