

COVID-19 Vaccines

BioNTech/Pfizer, Moderna, and Johnson & Johnson

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Three COVID-19 vaccines are now approved for use in the United States: BioNTech/Pfizer, Moderna, and Johnson & Johnson. The U.S. Food and Drug Administration (FDA) has granted **Emergency Use Authorization (EUA)** to each vaccine, which means they are considered effective against COVID-19 and safe for use during an emergency, but are still being tested. Approvals for the vaccines were based on data from more than 30,000 patients studied for at least two months (for each vaccine). Before the vaccines receive full FDA approval, the manufacturers must continue to follow patients from the trials to determine how well the vaccines work long-term and if there are any additional side effects.



Photo courtesy of Texas Center for Drug Development

Since the rollout of the first two vaccines, **several variants (or mutations) of SARS-CoV2 have emerged** that could potentially impact the vaccines' effectiveness. The highly contagious variants can evade the immune responses provided by the current shots or a previous COVID-19 infection. Vaccine manufacturers are collecting data to determine if the existing vaccines work against the variants or if booster shots will be required to fight them.

	BioNTech/Pfizer ¹	Moderna ²	Johnson & Johnson ³
Type	Genetic Vaccine (RNA-based): The RNA of a SARS-CoV2 protein is inserted into cells, which then produce the virus protein to generate an immune response. The vaccine does not change a person's genomic DNA but goes directly from RNA to protein using the cell's existing mechanism.		Viral-vector vaccine: A commonly studied virus, adenovirus, was engineered to produce SARS-CoV2 proteins to generate an immune response.
Age	16 and older	18 and older (currently testing for 12-17)	
Dose	2 doses (21 days apart)	2 doses (28 days apart)	1 dose (trials underway on a 2-dose regimen)
Storage	Ship at -94° F; Use within 5 days of thawing	Ship at -4° F; stable in refrigerator for 30 days and at room temp for 5 days	Stored at 36° F to 46° F (normal refrigerator temp) for up to 3 months.
Effectiveness	95% Effective	94% Effective	66% Effective overall; 85% effective against severe disease (including lower hospitalization and death rates).
Variant Effectiveness	Effectiveness does not include new variants (testing is underway to determine if a booster is needed).		Effectiveness rate included exposure to new variants.
Side Effects	Mild (transient) side effects, including injection site pain, fatigue, headache, muscle pain, and joint pain. No serious long-term effects noted.		

Endnotes

1. FDA, "Pfizer-BioNTech COVID-19 Vaccine VRBPAC Briefing Document," <https://www.fda.gov/media/144245/download>.
2. Lindsey R. Baden, et al., "Efficacy and Safety of the mRNA-1273 SARS-CoV-2 Vaccine," NEJM, December 20, 2020, <https://doi.org/10.1056/NEJMoa2035389>.
3. FDA, "Janssen Biotech, Inc. COVID-19 Vaccine Ad26.CO2.S Sponsor Briefing Document," <https://www.fda.gov/media/146219/download>.

Updated March 15, 2021