

# COVID-19 VACCINE NEWSLETTER

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## *Biden Plans to Release Majority of Available Doses <sup>1</sup>*

The outgoing Trump Administration has been distributing only half of the doses in reserve - an effort to save the required second doses. While this secures availability to reach the maximum efficacy rate with two doses, it severely limits vaccination opportunities for the healthcare workers and residents of long-term healthcare facilities that desperately need it. The decision by the Trump Administration was made at a time where manufacturing limitations were a concern. However, Pfizer and Moderna now have been ramping up the production of vaccines to meet United States and

global demand. There is a high likelihood that these companies will produce the required vaccines for second doses by the third-week (Pfizer) or fourth-week (Moderna) interval, so saving doses is not absolutely necessary. Biden's plans to distribute doses as they are manufactured will make sure that those most

at risk to get infected receive their vaccinations. On Thursday, Jan 14, he laid out a \$1.9 trillion plan for vaccine deployment, school reopenings, stimulus checks, and more. The all-out rapid-fire vaccinations will be the first step in the Biden Administration's pandemic response.



## *New Covid Variant Found in South Africa <sup>2</sup>*

In late 2020, a new variant of SARS-CoV-2 called B.1.1.7 originated in the United Kingdom and is now circulating in more than 30 countries, including the United States. Now, yet another Covid variant known as B.1.351 (or 501Y.V2) was first identified in South Africa and is setting off alarms. Like B.1.1.7, the South Africa variant is more infectious than SARS-CoV-2. In South Africa, cases of B.1.351 have surged. Since mid-November, it has been found in up to 90% of analyzed diagnostic samples.

We are much more prepared to combat these new mutations, though. Public

health guidelines like social distancing and mask-wearing are already in place. Additionally, those previously infected with Covid-19 are highly resistant to new strains, which may help in developing herd immunity.

However, there are concerns that the current vaccines may be less effective against B.1.351. In a con-

ference, Dr. Anthony Fauci stated that "it could be having some impact on protection for the monoclonal antibodies and perhaps even for the vaccine." Current vaccines may have to be altered to provoke the body to make different antibodies that match the South Africa variant's mutated spike proteins.



## **VACCINE HIGHLIGHTS**

- ◆ Biden plans to release all available doses, laying out a \$1.9 trillion plan
- ◆ A new, more contagious B.1.351 variant is found in South Africa
- ◆ The risks of the vaccine include anaphylaxis and allergic reactions
- ◆ A batch of the Moderna vaccine in California is found to cause allergic reactions and is briefly put on pause
- ◆ Sinovac clinical trials from Brazil show a low 50.38% efficacy rate

## **INSIDE THIS ISSUE:**

<i>Biden's Vaccine Plan</i>	1
<i>B.1.351 Variant</i>	1
<i>Vaccine Risks</i>	2
<i>Moderna Batch Paused</i>	2
<i>New Variants Spread</i>	2
<i>Four Types of Vaccines</i>	3
<i>Sinovac Results</i>	4
<i>U.S. Travel Rules</i>	4

1. Biden's plan to end policy of keeping Covid vaccine doses in reserve is the first step in a difficult journey, STAT News, Jan 8, 2021

2. Dr. Fauci warns Covid variant found in South Africa could pose threat to antibody drugs, CNBC, Jan 12, 2021

### *What Are the Risks of the Vaccine?*<sup>3</sup>

Although the vaccine is far safer than being infected, there are risks.

**Allergic reactions** to the vaccines are one of the most threatening side-effects. **Anaphylaxis** (allergic reactions across multiple organs) is even more severe, having a higher risk of death without immediate epinephrine (the medication in EpiPens) treatment. Some healthcare workers had trouble breathing or had to administer an EpiPen. While most of these healthcare workers had a previous history of allergies, a few did not, mean-

ing that emergency allergy treatment may be needed for all vaccinated.

Anaphylaxis and allergic reactions are quite common — hundreds of people die each year from food allergies alone. However, fatality in vaccination due to anaphylaxis are quite rare, mostly because vaccination sites are equipped with EpiPens. The rate of anaphylaxis in Covid-19 vaccinations is higher than the average for vaccinations, but this may be because side-effects are being monitored much more closely now.

**Inflammation and/or pain at the injection site** is a frequent side-effect. In Moderna's clinical trials, for example, 87.4% and 90.5% reported pain, redness, swelling, or tenderness for the first and second doses, respectively. This rate was actually lower (74.6% and 83.9%) for ages 65+. Fortunately, for most, these side-effects subsided after 1-2 days.



*ON JAN 14, THE DODGER STADIUM IN LOS ANGELES BECAME THE LARGEST VACCINATION SITE IN THE U.S.*



CALIFORNIA IS URGENTLY TRYING TO VACCINATE AS MANY PEOPLE AS POSSIBLE, WHILE CURRENT VACCINES ARE STILL VERY EFFECTIVE, AND BEFORE THE SPREAD OF NEW VARIANTS FROM U.K. AND SOUTH AFRICA.

### *A Batch of Moderna Vaccine Briefly Put on Pause*<sup>4</sup>

In California, a batch of the Moderna vaccine has been put on pause after reports of allergic reactions. At one clinic, there were several people vaccinated who needed emergency care (hospital or epinephrine treatment) within 24 hours. State epidemiologist Dr. Erica Pan stated that there were a higher than usual number of allergic reactions to the vaccines in the batch, and recommended the

distribution pause of over 330,000 doses. The pause comes at a time where the state needs vaccinations as fast as possible. Cases in California are rapidly increasing, with around 40,000 positive tests daily. California's hospitals are also reaching max capacity.

Moderna is working with the FDA and CDC to investigate the causes of the allergic reactions.

Moderna is unaware of any cases of allergic reactions from other vaccination centers that received the specific batch (containing 1,272,000 doses in total).

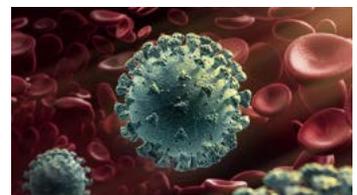


### *Spread of New Variants Could Cause 'Perpetual Infection'*<sup>5</sup>

In an interview, former FDA chief Scott Gottlieb brought up the possibility for "a perpetual infection heading into the spring and summer as these variants get a foothold here." Currently, the two major mutations of the coronavirus are B.1.1.7 from the U.K. and B.1.351 from South Africa. However, new variants are being discovered every day, such as a new U.S. strain discovered by Ohio State University researchers.

The constant mutations of the virus, possibly with different spike proteins, threaten the efficacy of vaccines and thus may bring the 'perpetual infection'. The primary goal now is to vaccinate as many people as we can, while current vaccines are still very effective. The longer vaccinations wait, the higher the chances of vaccines being less effective due to the new strains. The U.S. has distributed 30.6 million vaccines and

about a third of that amount has been used. Vaccine-makers are racing to manufacture and distribute more vaccines for immediate rollout.



3. The Risks of the Covid Vaccine, in Context, the New York Times, Dec 30, 2020

4. California recommends pausing a batch of Moderna vaccines after possible 'severe' allergic reactions, the New York Times, Jan 18, 2021

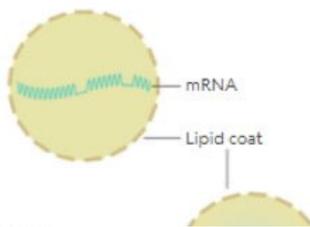
5. U.S. potentially facing 'perpetual infection' of Covid in spring as new variants spread, warns Dr. Scott Gottlieb, CNBC, Jan 14, 2021

## How Four Different Types of Covid Vaccines Work<sup>6</sup>

Currently, there are many vaccines in clinical trials or have gotten approval from governments across the world. These vaccines work differently in order to provide immunity to the body.

### mRNA Vaccines

Messenger RNA vaccines are based on the virus's genetic instructions to build the identifiable spike protein. They use messenger RNA contained in a lipid coat so that it can slide into the cells. Once in the cells, the mRNA gives genetic instructions to the ribosome, which starts making the spike proteins found on the exterior of the virus. On their own, these spike proteins are harmless but trigger an immune system response. The immune system recognizes the spikes as a real viral infection and creates antibodies and other defenses. If the real virus infects the body, antibodies with matching surface shapes will latch on the virus's spikes. The body knows to destroy the virus, and the virus cannot attach to other cells. Both the Pfizer and Moderna vaccines are mRNA vaccines. They require booster shots to prime the immune system well enough to combat infection.



Messenger RNA in a lipid coat

### Adenovirus-based Vaccines

Adenovirus-based vaccines also store instructions to build spike proteins, like mRNA vaccines. However, adenovirus-based vaccines use DNA instead of mRNA. This DNA is stored in

another virus called an adenovirus vector. A vector is a virus that lacks a gene responsible for reproduction and is used to transport genetic material from another virus into a cell. Adenovirus normally causes acute respiratory viral infections, e.g. flu. Once injected, the adenovirus gets contained in a bubble by a cell and is pulled inside. The adenovirus escapes the bubble and deposits the DNA into the nucleus, which converts it into mRNA. Ribosomes read the mRNA and build the virus's spike proteins that are recognized by the immune system and generate antibodies. The AstraZeneca, Sputnik V, and Johnson & Johnson vaccines are adenovirus-based vaccines. One risk with this vaccine is that the human body had already developed an immunity to the injected adenovirus, and hence, the vaccine would not trigger an immune response. This is why AstraZeneca uses a chimpanzee adenovirus. To increase chances for a stronger immune response, AstraZeneca started a clinical trial combining its vaccines with the Sputnik V vaccine, which uses two different adenovirus vectors for the initial shot and the booster shot, tricking the immune system to strongly react and generate antibodies intensely on both occasions.

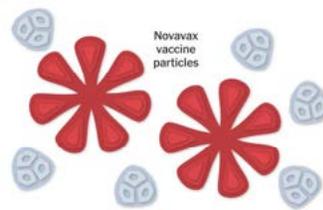


A chimpanzee adenovirus

### Protein-based Vaccines

Unlike mRNA or adenovirus-based vaccines, protein-based vaccines already contain the virus's spike protein instead of

genetic instructions for the ribosome to make them. Once injected, the spike proteins get engulfed by immune cells and trigger an immune response. The same process for mRNA or adenovirus-based vaccines is followed, and the immune system makes antibodies with matching surface shapes to the spike proteins. If the real virus infects the body, the body knows to destroy the virus, and the virus cannot attach to other cells. The Novavax vaccine is protein-based. To grow the spike proteins, they inserted genetic code contained in a different virus, a baculovirus, into a moth cell. Novavax assembled the proteins into nanoparticles, which were injected.



Novavax vaccine particles structure

### Inactivated vaccines

Inactivated vaccines use variants of the actual coronavirus to provide immunity. The variant is disabled, or inactivated, so they cannot replicate. Once the inactivated virus is injected, it is engulfed by an immune cell and trigger an immune response. The immune system makes antibodies with matching surface shapes to the spike proteins. If the real virus infects the body, the antibodies will prevent the virus from entering cells and replicating. The Sinopharm and Sinovac vaccines are inactivated vaccines. These inactivated viruses have been used for over a century and were used to combat diseases like polio, rabies, and hepatitis A.

AS OF JAN 19, THE PFIZER AND MODERNA VACCINES ARE THE ONLY ONES AUTHORIZED BY THE U.S. FDA. BOTH ARE MRNA VACCINES.

THE ASTRAZENACA ADENOVIRUS-BASED VACCINE HAS BEEN APPROVED IN THE U.K. AND INDIA. CORONAVAC, AN INACTIVATED VACCINE, HAS BEEN APPROVED IN CHINA AND LICENSED IN BRAZIL, TURKEY, AND INDONESIA.

CLINICAL TRIALS SO FAR SHOWED THAT THE STRONGEST IMMUNE RESPONSES ARE GENERATED BY THE MRNA VACCINES, AND THE WEAKEST RESPONSES FROM INACTIVATED VACCINES.

