

Africa Centres for Disease Control and Prevention (Africa CDC)

# Questions and answers on COVID-19 vaccine

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## How do vaccines work?

- Vaccines work by tricking your body into thinking it has been infected with a disease-causing organism (also called germs) such as a virus, prompting it to develop an immune reaction to the organism itself. This can be done in many different ways including growing the germ in a laboratory and then killing it so that it cannot cause disease anymore, using small pieces of the germ made from proteins from the surface of the germ, using weakened strains of the virus that are unable to cause disease, or using genetic material from the virus that is injected directly or packaged inside other harmless viruses, which are then used by the body's cells to make virus proteins.
- When injected with the vaccine, the body responds to the germ proteins in the vaccine by producing specific antibodies that attach to the proteins and prepare the body to fight infection by the germ. When the real germ then infects the body, the antibodies attach to proteins on the surface of the germ and prevent it from attaching to the cells of the body, thus preventing an infection.
- In addition to the antibodies, some vaccines also stimulate the body to produce other kinds of immune cells that specifically target the germ to kill it.
- When the body makes an immune response to a vaccine or infection, it produces special memory cells that lay in wait for a reappearance of the same germ later. If the body is re-exposed to the same germ, the memory cells immediately start reproducing and produce antibodies and killer immune cells.

## Will the COVID-19 vaccine be safe?



- The three largest COVID-19 vaccine studies that have announced preliminary results of their clinical trials found no serious side effects associated with the vaccines tested. As of 18 November 2020, these are the Pfizer and Moderna vaccines which are based on an mRNA platform and the AstraZeneca vaccine which uses a live virus vector. The side effects on humans were mild and included short-lived flu-like symptoms such as mild feverishness, muscle aches and tiredness. These occurred in fewer than 4% of people who received the vaccines. Similar results were found in earlier trials of other vaccines but these included fewer participants.



## How many vaccines are currently being developed for COVID-19?

As of 12 November 2020, 48 candidate vaccines were being evaluated in humans and 164 were in the earlier stages of development. Please see the WHO reports on the progress of development of these vaccines at: <https://www.who.int/publications/m/item/draft-landscape-of-covid-19-candidate-vaccines>

There are ongoing trial studies around the world on the efficacy of the vaccine candidates in humans, including studies of the six of the most promising COVID-19 vaccines in African countries.

## What kinds of COVID-19 vaccines are being developed?



There are essentially four broad categories of vaccines in development for COVID-19.

1. **Genetic vaccines.** These are made using small pieces of genes from SARS-CoV-2, the virus that causes COVID-19. When these gene fragments are injected into the body, the body cells use them to make proteins that are similar to those found on the surface of the virus, tricking the body into thinking that it has been infected with the virus. These genetic materials last only a short time in the body before they disintegrate and are expelled. The genetic vaccines closest to being internationally approved for COVID-19 are based on a gene fragment called messenger-RNA or mRNA, which is packaged inside tiny envelopes of lipid to help it enter the human cells. This new technology has never been licensed for vaccine development, although experimental vaccines have been developed using it for several other diseases for

many years. Two COVID-19 vaccine candidates using this technology are currently undergoing large efficacy trials that have recently announced their preliminary results and are likely to be the first to be authorized for public use internationally.<sup>1</sup>

2. **Inactivated ("killed") vaccines.** This is a technology that has been used for decades to make vaccines for other diseases such as polio (the injectable form), hepatitis, and influenza. There are several COVID-19 candidate vaccines of this type in advance human efficacy trials, but no results have been announced as of early November 2020. These vaccines are primarily being developed by companies in China, India and Turkey.
3. **Protein subunit vaccines.** Subunits are small pieces of proteins that can be produced either by growing the virus in cell cultures and then separating the desired protein subunits to use as a vaccine, or by inserting the gene for the subunit into another organism such as a yeast and producing it by growing the yeast.
4. **Viral vector vaccines.** These vaccines are produced by inserting a gene from the SARS-CoV-2 virus into a virus that is relatively harmless to humans, like those responsible for the common cold. The harmless virus causes a mild infection, but also causes the body to produce a key protein normally found on the surface of the SARS-CoV-2 virus. This method was used to produce the Ebola virus vaccine, which has been used to successfully control the recent Ebola outbreaks in the Democratic Republic of the Congo. AstraZeneca has developed a COVID-19 vaccine

<sup>1</sup>There are also different vaccines that have now been developed and used widely in Russia and China made by the companies Gamaleya and Sinopharm, respectively, but those have not yet been approved for use outside of their countries of origin.

using this technology and published the preliminary efficacy results.

- There is some evidence that vaccines against other diseases such as tuberculosis, polio, and measles may indirectly boost the immune system's ability to resist SARS-CoV-2 infection. Studies are currently going on in Africa to know if BCG, oral polio and measles vaccines can offer some protection against COVID-19.

## What is the difference between the vaccines being developed for COVID-19?

- The vaccines that are closest to being available for widespread use against COVID-19 are similar in one respect, they target a key protein on the surface of the virus, which is responsible for allowing the virus to attach to human cells. There are other vaccines in earlier stages of development that use other protein targets on the virus.
- The differences are as follows:

- **Preparation:** Some of the vaccines include an additional component called "adjuvant". Adjuvants are special chemicals added to vaccines to boost the body's response to the vaccine itself. Most of the inactivated and protein sub-unit COVID-19 vaccines being developed contain adjuvants.
- **Storage:** There are differences in the cold storage requirements for the different vaccines. The two frontrunner vaccines require very cold storage conditions – the Pfizer vaccine requires storage at -70°C and the Moderna vaccine -20°C. The AstraZeneca vaccine, on the other hand, can be stored at normal refrigerator temperatures (2-8°C) for up to six months. The manufacturers of the other vaccines have not yet made the cold chain requirements public but based on experience with other vaccines of the same type, storage requirements will likely be less demanding for the two mRNA vaccines. This may be an

important factor in decisions about distribution to countries. Some vaccines in the very early stages of development may even be stable at room temperature.

- **Dosage and administration:** Most of the vaccines in advance stages of trial require two doses to be effective. Several of the live viral vector vaccines, however, including some that may be administered orally or nasally, appear to promote immunity after a single dose.
- **Use as booster:** It is currently unknown how long immunity would last after either natural infection or vaccination. Booster doses may be needed later in life as is the case with vaccines against influenza, tetanus and diphtheria. Some of the vaccines may not be capable of being used later as boosters. For example, the vaccines that are based on vectors using benign viruses will likely not be capable of being given in multiple doses over time. Once the vaccine is administered, the recipient will not only develop immunity to COVID-19 but will also develop antibodies against the vector virus that carries the SARS-CoV-2 gene fragment. This will make a second dose unnecessary.

## How efficacious are the vaccines being developed against COVID-19?



- Early results of large clinical trials of the two frontrunner COVID-19 vaccines, both of which are mRNA vaccines, indicate that both of them have more than 90% efficacy. Early data indicate that they are as effective in the elderly as they are in younger people. However, more studies are needed to understand how well they protect individuals with pre-existing immune system problems. AstraZeneca has announced that its viral vector vaccine has an overall efficacy of 70% but was more than 90% when given at a different dose regimen (a low dose followed by a full dose four weeks later). Data on several other vaccines is expected soon.

## When will the COVID-19 vaccine be available in Africa?

- The COVID-19 vaccine should be available for use in Africa in the first half of 2021.

## Who will be the first to receive the COVID-19 vaccine when it becomes available?

- Ultimately, the goal is to produce enough doses of the vaccine for everyone who needs it. However, it will take time to produce enough for the entire population globally. Only limited amounts of vaccine will be available in the beginning. WHO, in consultation with Ministries of Health and other experts, has developed a recommended prioritization strategy to use the vaccine in the most effective way possible so it can have the greatest impact on lowering deaths from COVID-19. The following documents describe the rationale behind the prioritization strategy:

Draft Fair Allocation Mechanism: <https://www.who.int/publications/m/item/fair-allocation-mechanism-for-covid-19-vaccines-through-the-covax-facility>

Roadmap: [https://www.who.int/docs/default-source/immunization/sage/covid/sage-prioritization-roadmap-covid19-vaccines.pdf?Status=Temp&sfvrsn=bf227443\\_2&ua=1](https://www.who.int/docs/default-source/immunization/sage/covid/sage-prioritization-roadmap-covid19-vaccines.pdf?Status=Temp&sfvrsn=bf227443_2&ua=1)

Values Framework: <https://apps.who.int/iris/bitstream/handle/10665/334299/WHO-2019-nCoV-SAGE-Framework-Allocation-and-prioritization-2020.1-eng.pdf?ua=1&ua=1>

- The first group prioritized for vaccination will likely be healthcare providers. This is important to protect them from infection so that the healthcare system can continue to function, and to prevent possible transmission to their patients.

- The other group that will be a high priority to vaccinate as soon as possible include the elderly and people with underlying medical conditions such as diabetes, chronic lung disease, chronic kidney disease, and other illnesses that place them at increased risk of dying from COVID-19. The final decisions about prioritization will depend on the local situation. National governments will have to carefully weigh the risks and benefits of different strategies.

## How many doses of the COVID-19 vaccine will be available for Africa?



- WHO has been working with Gavi, the Vaccine Alliance; the Coalition for Epidemic Preparedness Innovation (CEPI); and other organizations to develop a programme for the equitable distribution of COVID-19 vaccines. This has resulted in the creation of the COVAX facility, which allows countries to join a buying group to get the best price possible on COVID-19 vaccines. Funding support will be available to countries with limited resources to support purchase of vaccine and implementation of a vaccine delivery programme. There is a plan for initial proportional allocation of doses to countries until all countries have enough to cover 20% of their population, subject to sufficient donor support.

## How can I be sure that my country will be able to afford the COVID-19 vaccine?

Through COVAX, all countries will have access to vaccines for a proportion of their population. For 92 low and lower-middle income and World Bank International Development Association (IDA)-eligible countries, the COVAX Advanced Market Commitment (AMC) is facilitating procurement for up to 20% of a country's population. AMC countries will be required to cost-share \$1.60-\$2.00/dose. Upper-middle and

high-income countries can procure doses for 10-50% of their populations through the COVAX facility. Countries that are part of the facility and are self-financing will have opportunity to access the largest and most-diverse portfolio of vaccine candidates. Countries interested in joining the COVAX can get more information by e-mailing [covax@gavi.org](mailto:covax@gavi.org) or contacting the appropriate Gavi Senior Country Manager, or through the WHO country office, if they are non-Gavi eligible.

## How long will immunity to COVID-19 last if I get vaccinated?

- Human trials looking at protection from COVID-19 only started in the third quarter of 2020. Although immune response to most of the vaccines looks promising, and preliminary data suggest that at least two of the vaccines provide more than 90% protection against symptomatic disease, the trials have not gone on long enough to know how long this protection will last.
- However, it is known that natural infection with other human coronaviruses may not be permanent or may only be partial. Indeed, there have been some documented cases of re-infection with COVID-19, although this does not appear to be common. Since this virus is new, we do not know how long natural immunity may last.



- Africa CDC is closely monitoring the studies on vaccine efficacy to better understand how long immunity may last and whether or not booster doses may be required.

## Will I be able to go back to my normal life and stop wearing a mask after I'm vaccinated?

- There is not enough information currently available about when it is safe for people to stop wearing masks and to avoid close contact with others to help prevent the spread of COVID-19. Preliminary evidence suggests that the vaccines closest to being available to the public are effective at preventing COVID-19 *illness*, but the studies have not examined whether or not the vaccines prevent *re-infection* and transmission of the virus that causes COVID-19. That is, there is the possibility that someone who is vaccinated will be protected from getting sick with the disease, but they may still be infected asymptotically and pass the virus to others. Therefore, until this question is answered it is safer to continue wearing masks and practicing physical distancing and washing of hands until most of the people who are highly susceptible to severe COVID-19 disease are vaccinated.



**Africa Centres for Disease Control and Prevention (Africa CDC),  
African Union Commission**

Roosevelt Street W21 K19, Addis Ababa, Ethiopia