English

WHO Collaborating Centre for Vaccine Safety

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COVID-19 vaccines and vaccination explained

Videos and podcast for health workers and the public that address common questions about COVID-19 vaccines

For updated information please, visit the official website:
https://www.covid19infovaccines.com/.
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Please check your country's official recommendations regarding COVID-19 vaccines and vaccinations.

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1 General questions

1.1 How could vaccines be developed at record speed while still maintaining quality and safety?

> **Version:** *2021-04-14*

> **Tags:** *safety, vaccine development, quality*

Before authorization, all vaccines have to go through preclinical and three phases of clinical trials. Although the vaccines are developed at record speed, no compromise is made on ensuring their safety and efficacy.

The following three things have made it possible for the vaccines to be developed so quickly while still being high quality and safe:

- First, by building on scientific and technological progress: Investments in new technologies over the last few years have made it possible for many labs around the world to work with new vaccine platforms, such as mRNA, for other infections. As soon as the necessary information about the virus that causes COVID-19 was available, scientists began designing the mRNA instructions which would allow the host cells to build the unique spike protein of SARS-CoV-2 into an mRNA vaccine.
- Second, by optimizing development and regulatory processes: by conducting trials in parallel rather than sequentially; by early communication and alignment on trial design; by exploring flexibilities such as regulatory review of data on a rolling basis (as soon as they are made available); by promoting regulatory reliance on generated evidence through collaborative approaches, transparency and sharing of information. This way, timelines for development were accelerated for these vaccines by overlapping phases one and two of clinical trials. Regulatory approval was accelerated by ensuring that regulatory agencies were ready and flexible to review each phase quickly so, if all went well, they could approve each next step soon after data from the previous step became available. Sharing of information among regulatory authorities is common practice and this also helps improve and speed up the regulatory process.
- And third, by investing in manufacturing despite the financial risk: Investments were made well before the end of the clinical trials so that it was possible to have millions of doses ready to deploy if the vaccine was licensed.

Rapid development of safe and effective vaccines made possible by:

- new technologies
- parallel clinical trial phases
- rolling regulatory reviews, collaboration and reliance
- up front investments in manufacturing

1.2 What are clinical trials and are they enough to prove a vaccine is safe?

> **Version:** *2022-05-23*

> **Tags:** *vaccine safety, vaccine development, clinical trials*

Clinical trials are research studies performed in people to evaluate a medical, surgical, or behavioral intervention. They are the primary way that researchers find out if a new treatment or medical device, including a vaccine, is safe and effective in people.

Clinical trials advance through four phases to test a vaccine, find the appropriate dosage, and look for side effects. If, after the first three phases, researchers find a vaccine to be safe and effective, regulatory agencies can evaluate all the information and may approve it for clinical use while continuing to monitor its effects.

A Phase I trial tests an experimental vaccine on a small group of often healthy people (20 to 80) to judge its safety and side effects.

A Phase II trial uses more people (100 to 300). While the emphasis in Phase I is on safety, Phase II focuses on safety, immunogenicity (the immune response triggered by the vaccine), and efficacy (whether the vaccine prevents the disease). So, this phase gathers data on whether the vaccine generates an immune response in people in various categories of age, ethnicity and gender.

A Phase III trial gathers more information about efficacy and safety, studying different populations and different dosages. The number of subjects usually ranges from several hundred to thousands of people. Phase 3 trial is essential for registration and approval to market of a vaccine. If the regulatory authority agrees that the trial results are positive, it will approve the new vaccine.

Phase IV trials take place after approval of use. Effectiveness and safety are monitored in large, diverse populations. Sometimes, the side effects of a vaccine may not become clear until more people have taken it over a longer period of time.

All of these steps are standard in vaccine development, and all of them have been followed in developing COVID-19 vaccines that have received WHO Emergency Use Listing pre-qualification or authorization from stringent regulatory authorities.

1.3 How do mRNA vaccines, like Pfizer-BioNTech and Moderna COVID-19 vaccines, work?

> **Version:** *2021-04-14*

> **Tags:** *mRNA vaccines, how vaccines work, Comirnaty, mRNA-1273, Moderna, Pfizer-BioNTech*

COVID-19 mRNA vaccines instruct our cells to make a harmless piece of what is called the “spike protein.” The spike protein is found on the surface of the virus that causes COVID-19. COVID-19 mRNA vaccines are given in the upper arm muscle. Once the instructions (mRNA) are inside the muscle cells, the cells use them to make the protein piece. After the protein piece is made, the cell breaks down the instructions and gets rid of them. Next, the cell displays the protein piece on its surface. Our immune systems recognize that the protein

doesn't belong there and begin building an immune response by making antibodies, just like what would happen if we were naturally infected with the virus that causes COVID-19.

At the end of the process, our bodies have learned how to protect against future infection. The benefit of mRNA vaccines, like all vaccines, is that vaccinated people gain this protection without ever having to risk the serious consequences of getting sick with COVID-19.

The vaccine cannot give someone COVID-19, because mRNA vaccines do not use the live virus that causes COVID-19. They also do not affect or interact with our DNA in any way.

mRNA vaccines:

- instruct a person's cells to make the COVID-19 spike protein, which triggers an immune response
- cannot give someone COVID-19
- cannot affect their DNA.

1.4 How do vector vaccines work?

> **Version:** *2023-03-17*

> **Tags:** *vector vaccines, how vaccines work, Vaxzevria - Oxford-Astra Zeneca Vaccine, Janssen COVID-19 Vaccine (Johnson & Johnson), CanSino vaccine Ad5-nCoV-S (Convidecia)*

Viral vector-based vaccines differ from most conventional vaccines in that they don't actually contain antigens, but rather use the body's own cells to produce them. They do this by using a modified virus (the vector) to deliver genetic code for the antigen, in the case of COVID-19 the spike proteins found on the surface of the virus, into human cells. By infecting cells and instructing them to make large amounts of antigen, which then trigger an immune response, the vaccine mimics what happens during natural infection with certain pathogens - especially viruses. This has the advantage of triggering a strong cellular immune response by T cells as well the production of antibodies by B cells.

COVID-19 vector vaccines use a harmless non-replicating virus, which carries the gene of the COVID-19 spike proteins. After entering the human cell, the vector virus is unable to produce further copies of itself, it cannot cause COVID-19 disease and it does not enter the nucleus of the cell where our DNA (genetic material) is located, so it cannot change or influence our genes.

1.5 How should we respond to claims that the mRNA vaccines could cause a genetic change and that we will see this in the coming decades?

> **Version:** *2021-06-29*

> **Tags:** *genetic change, genome integration, mRNA vaccines, how vaccines work, Comirnaty, mRNA-1273, Moderna, Pfizer-BioNTech*

The mRNA vaccine is injected into human cells, which then churn out copies of the virus's spike protein. This triggers an immune response inside our bodies. That immune response, which produces antibodies, is what protects us from getting infected if the real virus enters our bodies.

The RNA based vaccines are safe: to produce them involves making genetic material only, not the virus. They teach our cells how to make a protein—or even just a piece of a protein—that triggers an immune response inside our bodies. The mRNA of the vaccine cannot interfere with the human genetic system, a concern which has been raised by some. This is because humans do not have a mechanism to convert the RNA back into DNA. mRNA never enters the nucleus of the cell, which is where our DNA (genetic material) is kept. The cell breaks down and gets rid of the mRNA soon after it is finished using the instructions.

The fast and highly scalable mRNA manufacturing process enables rapid production of many vaccine doses, making it suitable for rapid vaccine development and pandemic vaccine supply.

mRNA is a new platform for vaccines but there is no reason why it should be any less safe than any of the other platforms. There are reasons, theoretically, why it could be safer than other existing platforms, for example, compared to vaccines using attenuated viruses (as there is no risk of the attenuated pathogen reverting to a dangerous form) or viral proteins (as there is no addition of adjuvants/immunostimulants, which can sometimes denature the viral proteins).

mRNA-based vaccines:

- teach our cells how to make a part of a protein
- the cell gets rid of the mRNA soon after
- cannot interfere with the human genetic system

1.9 How do protein-based vaccines work?

> **Version:** *2023-03-17*

> **Tags:** *COVID-19 vaccines, protein vaccines, Nuvaxovid / Covovax*

Rather than injecting a whole pathogen to trigger an immune response, subunit vaccines (sometimes called acellular vaccines) contain purified pieces of it, which have been specially selected for their ability to stimulate immune cells. Because these fragments are incapable of causing disease, subunit vaccines are considered very safe. There are several types: protein subunit vaccines contain specific isolated proteins from viral or bacterial pathogens; polysaccharide vaccines contain chains of sugar molecules (polysaccharides) found in the cell walls of some bacteria; conjugate subunit vaccines bind a polysaccharide chain to a carrier protein to try and boost the immune response. Only protein subunit vaccines are being developed against the virus that causes COVID-19.

Other subunit vaccines are already in widespread use. Examples include the hepatitis B and acellular pertussis vaccines (protein subunit), the pneumococcal polysaccharide vaccine, and the MenACWY vaccine, which contains polysaccharides from the surface of four types of the bacteria that causes meningococcal disease joined to diphtheria or tetanus toxoid (conjugate subunit).

Subunit vaccines contain fragments of protein and/or polysaccharide from the pathogen, which have been carefully studied to identify which combinations of these molecules are likely to produce a strong and effective immune response. By restricting the immune system's access to the pathogen in this way, the risk of side effects is minimized. Such vaccines are also relatively inexpensive and easy to produce, and more stable than those containing whole viruses or bacteria.

A downside of this precision is that the antigens used to elicit an immune response may lack molecular structures called pathogen-associated molecular patterns, which are common to a class of pathogen. These structures can be read by immune cells and recognized as danger signals, so their absence may result in a weaker immune response. Also, because the antigens do not infect cells, subunit vaccines mainly only trigger antibody-mediated immune responses. Again, this means the immune response may be weaker than with other types of vaccines. To overcome this problem, subunit vaccines are sometimes delivered alongside adjuvants (agents that stimulate the immune system) and booster doses may be required.

Update (March 2023): One protein based vaccine (Nuvaxovid / Covovax) has been granted WHO Emergency Use Listing.

1.10 How do I know which COVID-19 vaccine to choose or recommend?

> **Version:** *2023-03-17*

> **Tags:** *COVID-19 vaccines, emergency use listing (EUL), Pfizer-BioNTech, BNT162b2, Moderna, mRNA-1273, Oxford-AstraZeneca, AZD1222, Janssen, Sinopharm, Sinovac*

All COVID-19 vaccines that have received WHO Emergency Use Listing approval and/or stringent regulatory agencies' emergency authorization have fulfilled all regulatory approvals and standards. The WHO Strategic Advisory Group of Experts (SAGE) has issued recommendations on the use of several vaccines, and continuously reviews evidence on new products. Some national regulators have also assessed other COVID-19 vaccine products for use in their countries.

Slight differences on age upper and lower limits, characteristics and properties of the type of vaccine used (for example mRNA, vector, protein based, live attenuated) and individual comorbidities (such as polysorbate allergic reactions or immunocompromised individuals) and conditions (for example pregnancy) can lean the scale towards one type or other. Therefore, in very particular cases, a risk-assessment and clinical evaluation may need to be performed to determine the most suitable vaccine for specific vaccines.

Consult with a healthcare professional for further questions and personal advice.

1.11 What tests or examinations should people get before COVID-19 vaccination?

> **Version:** *2021-04-14*

In general, prior testing or examinations of people before COVID-19 vaccination, beyond the usual anamnesis and check-list of potential contraindications, is not recommended. Only in specific circumstances, when potential contraindications may exist, might specific tests be requested by your physician. A pregnancy test before vaccination is not indicated either

1.12 Can a new variant of the SARS-CoV-2 virus cause more severe disease?

> **Version:** *2023-03-17*

Viruses mutate continuously and this can lead to new variants. Of the thousands of variants that are emerging on the SARS-CoV-2 genomes, it is reasonable to expect that some variants can eventually achieve biological advantages and be more transmissible, clinically aggressive or resistant to treatments or vaccines. Randomness and social behavior can also explain the predominance of a particular strain.

Update (March 2023):

For more information on SARS-CoV-2 variants see: https://www.who.int/activities/tracking-SARS-CoV-2-variants

1.13 Why should older adults get vaccinated?

> **Version:** *2022-02-11*

Older unvaccinated adults are more likely to be hospitalized or die from COVID-19. The risk for severe illness with COVID-19 increases with age, with older adults facing the highest risk. Moreover, this risk increases if you have a chronic condition or a weakened immune system. Because of this, older adults are one of the first groups of people being offered the COVID-19 vaccine.

Real-world assessments of COVID-19 vaccines have shown that full vaccination was effective in preventing 94-96% of COVID-19-associated hospitalizations among adults aged ≥65 years.

COVID-19 vaccines continue to provide strong protection against severe disease and death associated with emerging virus variants, including Delta and Omicron. The vaccines have been shown to be safe in older adults, including those with chronic conditions or a weakened immune system. Most of the side effects are mild and short-term, and not everyone gets them.

1.16 If COVID-19 becomes endemic will vaccination still be needed?

> **Version:** *2022-04-07*

The term ‘endemic’ describes a disease that is regularly found among particular people or in a certain area. It does not say anything about how deadly or frequent a disease is. At this point, we do not yet know whether COVID-19 will become endemic, nor whether vaccination will be needed in the longer term.

Globally, we should aim for a response system that is always ready and can be scaled up quickly to minimize the impact of COVID-19 disease through the effective use of vaccines, therapeutics, and other preventive measures.

1.17 Why is it necessary to stay in the healthcare facility 15-30 minutes following COVID-19 vaccination?

> **Version:** *2022-09-20*

This general practice is necessary after administration of any vaccine to monitor a person's reaction to the vaccine and ensure first aid is available if they experience any severe allergic reactions, including anaphylactic shock. Anaphylactic reactions can be potentially life-threatening if not detected and treated promptly. Symptoms can include a rapid, weak pulse, skin rash, fainting, wheezing, nausea and vomiting.

Recommendations regarding the duration of the observation time may vary by country. In general, upon receiving the vaccine a person should be requested to stay for 15–30 minutes at the healthcare facility or community vaccination center where healthcare professionals are available in case of any immediate reactions to provide first aid.

In general, persons with a severe allergic reaction to the first dose should not receive additional doses of the same vaccine. In addition, individuals should alert their local health providers following vaccination if they experience any unexpected side effects or other health events.

1.18 Is it possible to catch COVID-19 during an immunization visit to a healthcare facility?

> **Version:** *2022-09-20*

During a visit to the hospital or another healthcare facility, it is possible to get infected with the virus that causes COVID-19: people come to these facilities with and without symptoms for medical care.

In general, immunization sessions are organized in such a way as to minimize the risk of infection with COVID-19 or other diseases, including through hand hygiene, use of personal protective equipment, environmental cleaning, prompt waste management and by separating patients and healthy people via separate opening hours or entrances.

Each person visiting a health facility should also comply with recommendations provided by local authorities and healthcare providers to protect themselves and others.

1.19 What are the so-called COVID-19 bivalent booster vaccines?

> **Version:** *2022-09-20*

Some of the existing mRNA COVID-19 vaccines have been adapted to better match the circulating variants of SARS-CoV-2. The updated vaccines contain two messenger RNA molecules: one with instructions for producing a protein from the original strain of SARS-CoV-2; and the other one - either a molecule with instructions for producing a protein from the Omicron BA.1 subvariant or a molecule with instructions for producing a protein from the Omicron BA.4 and BA.5 subvariants of SARS-CoV-2.

These updated vaccines can broaden protection against different variants and are therefore expected to help maintain optimal protection against COVID-19 as the virus evolves.

The European Medicines Agency's human medicines committee (CHMP) has recommended since 1 September 2022 to authorize the three following bivalent vaccines adapted to provide broader protection against COVID-19:

- Pfizer's Comirnaty Original/Omicron BA.1
- Spikevax bivalent Original/Omicron BA.1 and
- Pfizer-BioNTech's Comirnaty Original/Omicron BA.4-5.

The bi-valent vaccines are intended for use as booster doses in people aged 12 years and above who have received at least primary vaccination against COVID-19. These adapted versions of the original vaccines Comirnaty (Pfizer-BioNTech) and Spikevax (formerly Moderna) can trigger strong immune responses against Omicron BA.1 and the original SARS-CoV-2 strain in people previously vaccinated. In particular, they were more effective at triggering immune responses against the BA.1 subvariant than the original vaccines. Side effects observed with the adapted vaccines were comparable to those seen with the original ones and were typically mild and short-lived.

The BA4-BA5-containing bivalent vaccines were approved to maximize protection against currently circulating Omicron variant lineages based on the totality of available evidence, including:

- extensive safety and effectiveness data for each of the monovalent mRNA COVID-19 vaccines,
- safety and immunogenicity data obtained from a clinical study of a bivalent COVID-19 vaccine that contained mRNA from Omicron variant BA.1 lineage, and
- nonclinical data obtained using a bivalent COVID-19 vaccine that contained mRNA of the original strain and mRNA in common between the BA.4 and BA.5 lineages of the Omicron variant.

Similarly, the US Food and Drug Administration amended the emergency use authorizations of the Moderna COVID-19 vaccine and the Pfizer-BioNTech COVID-19 vaccine to authorize bivalent formulations of the vaccines (Moderna COVID-19 Vaccine, Bivalent (Original and Omicron BA.4/BA.5) and Pfizer-BioNTech COVID-19 vaccine, bivalent (original and Omicron BA.4/BA.5)) for use as a single booster dose following primary or booster vaccination.

As the pandemic evolves, the strategy is to have a broad range of adapted vaccines that target different SARS-CoV-2 variants so countries have a plurality of options to meet their needs when they design their vaccination strategies. This is a key element in the overall strategy to combat the pandemic as it is not possible to predict how the virus will evolve in the future and which variants will be circulating this winter.

The original vaccines, Comirnaty and Spikevax (formerly Moderna), are still effective at preventing severe disease, hospitalization and death associated with COVID-19 and will continue to be used within vaccination campaigns in the EU, in particular for primary vaccinations.

1.20 What is the recommended use of updated bivalent COVID-19 booster vaccines?

> **Version:** *2022-09-20*

National authorities will determine who should receive which vaccines and when, taking into account factors such as infection and hospitalization rates, the risk to vulnerable populations, vaccination coverage and vaccine availability.

The original COVID-19 vaccines are still effective at preventing severe disease, hospitalization and death associated with COVID-19 and will continue to be used within vaccination campaigns, in particular for primary vaccinations.

Updated bivalent vaccines (i.e. Moderna's Spikevax bivalent Original/Omicron BA.1 vaccine, Pfizer-BioNTech's Comirnaty Original/Omicron BA.1 and Pfizer-BioNTech's Comirnaty Original/Omicron BA.4-5) are recommended by the European Medicines Agency (EMA) for use in adults and adolescents from the age of 12 years, for a booster dose at least 3 months after primary vaccination (or an earlier booster dose) with a COVID-19 vaccine.

The US Food and Drug Administration (FDA) recommends that a booster with one of these bivalent vaccines be administered at least 2 months after the last COVID-19 vaccine dose and as a single dose. Moderna's Spikevax bivalent Original/Omicron BA.1 vaccine is authorized for use as a single booster dose in individuals 18 years of age and older. The Pfizer-BioNTech's Comirnaty Original/Omicron BA.1 and Pfizer-BioNTech's Comirnaty Original/Omicron BA.4-5 are authorized for use as a single booster dose in individuals 12 years of age and older.

1.21 How do the updated bivalent COVID-19 vaccines work?

> **Version:** *2022-09-20*

The updated bivalent vaccines work in the same way as the original vaccines, by preparing the body to defend itself against COVID-19. Each vaccine contains molecules called mRNA, which have instructions for making the spike proteins of the original SARS-CoV-2 and the Omicron subvariant. The spike protein is a protein on the surface of the virus, which the virus needs to enter the body's cells, and can differ between variants of the virus. By adapting vaccines, the aim is to broaden protection against different COVID-19 virus variants.

When a person is given one of these vaccines, some of their cells will read the mRNA instructions and temporarily produce the spike proteins. The person's immune system will then recognize those proteins as foreign and activate natural defences — antibodies and T-cells — against them.

If, later on, the vaccinated person comes into contact with the virus, the immune system will recognize the spike protein on its surface and be prepared to attack it. The antibodies and immune cells can protect against COVID-19 by working together to kill the virus, preventing its entry into the body's cells and destroying infected cells.

The mRNA molecules from the vaccines do not stay in the body but are broken down shortly after vaccination.

2 Vaccines and infection

2.1 Can people still get COVID-19 after being vaccinated?

> **Version:** *2021-12-17*

> **Tags:** *mRNA vaccines, transmission, Comirnaty, mRNA-1273, Moderna, Pfizer-BioNTech, Oxford-AstraZeneca, AZD1222, Janssen, Sinopharm, Sinovac*

In general, there are several factors to keep in mind:

- Vaccination provides protection from severe COVID-19 disease and reduces the risk of being infected with the virus. However, vaccination may not fully prevent you from becoming infected, with mild or no symptoms, and then transmitting the virus on to others.
- After receiving the first dose, it takes time for your body to develop protection. So, you can be infected with the virus in the days following vaccination before the vaccine has begun to provide protection.
- Getting all recommended doses is important to the body to build the strongest possible defense against developing COVID-19 disease.

For all these reasons, it is very important that everyone who gets vaccinated still continues to take precautions like physical distancing, using a mask, cleaning hands and avoiding crowded places.

2.13 What will happen if the vaccines are no longer effective against the new variants?

> **Version:** *2021-04-14*

We know that SARS-CoV-2 viruses will continue to evolve. Some new virus variants may be associated with biological advantages eventually leading to higher transmissibility, disease severity, risk of reinfection, or a change in antigenic target of vaccines resulting in lower vaccine effectiveness. But this will not happen suddenly, meaning that vaccine-induced protection is wide and includes both humoral and cellular response. The S protein -the antigen contained in the vaccines- is large, and thus, elicits a wide array of neutralizing antibodies. However, once a critical number of mutations accumulates in the receptor binding domain of the S protein, the neutralizing capacity of the vaccine may get compromised.

WHO and partners are undertaking a coordinated approach to monitor and evaluate variants and their impact on vaccine effectiveness.

We need to do everything we can to reduce circulation of the virus and delay mutations that may reduce the efficacy of existing vaccines. The virus only evolves through replication and thus, prevention of infection with all available means will reduce the chances that escape variants emerge. Nevertheless, it seems increasingly clear that manufacturers will have, and are ready, to adjust to the COVID-19 viral evolution, taking into account the latest variants for future vaccine developments or booster shots.

2.16 How can we ever get back to normal life if the virus mutates faster than scientists can adjust the vaccine?

> **Version:** *2021-04-14*

The first priority is to save lives and control the epidemic. To consider the possibility of eliminating or eradicating COVID-19, several factors apply, including how long the vaccine's protection lasts and how effective vaccine programmes will be in achieving high coverage, among other factors.

Even the existence of a highly effective vaccine is no guarantee that we will be able to eliminate or eradicate the virus. One likely scenario in the context of an effective global vaccination programme is that the virus would become an endemic virus with a low level of threat.

In any case, vaccine manufacturers are ready to adapt their vaccines to the new variants. And importantly, the viruses only mutate if they can replicate, and for that they need to infect. Thus, preventing infection by all available means is the best we can do to protect ourselves but also to limit virus evolution.

2.24 If a vaccinated or unvaccinated person contracts COVID-19 should they be given antibiotics?

> **Version:** *2022-11-07*

Antibiotics work on bacteria to kill or slow their growth. COVID-19 is a viral disease, and there are no antibiotics that kill SARS-CoV-2, the virus that causes COVID-19.

COVID-19 illness can include viral lung infection (viral pneumonia). A small number of patients with viral pneumonias can also develop a bacterial infection in the lungs. If there is a secondary bacterial infection it may need to be treated with an antibiotic. Regardless of whether a person is vaccinated against COVID-19 or not, if there is no bacterial infection, then antibiotics are not needed.

Unnecessary prescription of antibiotics contributes to the development of antimicrobial resistance.

2.25 Does vaccination against COVID-19 have any impact on the use of antibiotics to treat COVID-19 complications?

> **Version:** *2022-11-07*

Vaccination against COVID-19 greatly reduces the risk of developing serious complications from COVID-19, especially in people with underlying medical conditions. Accordingly, a smaller number of COVID-19 patients would develop a secondary bacterial infection, which may need to be treated with an antibiotic.

By preventing severe disease, vaccination against COVID-19 reduces the need for antibiotics in at-risk patients and also reduces the inappropriate use of antibiotics for serious viral infections that do not require or benefit from antibiotics.

3 Vaccine efficacy and duration of protection

3.1 How quickly does the vaccine work and how long does the protection last?

> **Version:** *2023-03-17*

It generally takes 1-2 weeks following COVID-19 vaccination for the body to build immunity against the virus.

Duration of protection differs per vaccine and may be influenced by who receives it. People who are immuno-compromised tend to develop a weaker immune response to the standard number of vaccines doses, and therefore need an additional dose in the primary series. Immunity against mild infection starts to wane in the months following vaccination, especially among older adults. This is why many countries have introduced a booster dose, starting with the older age groups.

Update (March 2023):

The booster dose policy in countries is evolving. For current WHO booster recommendations see: https://www.who.int/publications/i/item/WHO-2019-nCoV-vaccines-SAGE-good-practice-statement-second-booster

3.3 Will vaccines be able to eliminate or eradicate COVID-19?

> **Version:** *2021-04-14*

> **Tags:** *elimination, eradication*

- The first priority is to save lives and control the epidemic. To consider the possibility of eliminating or eradicating COVID-19, we would need to see how long the vaccines provide coverage for, and how effective vaccine programmes are in achieving high coverage.
- But even the existence of a highly effective vaccine is no guarantee that we will be able to eliminate or eradicate the virus. The likely scenario in the context of an effective global vaccination programme is that the virus would become an endemic virus with a low level of threat.

3.5 If an individual did not develop high antibody titers after vaccination, should he/she be vaccinated again with another vaccine? Is it safe? What should be an interval between two vaccinations?

> **Version:** *2021-04-14*

> **Tags:** *antibody titres, vaccine failure, safety, intervals*

WHO does not recommend testing for antibodies after any routine or seasonal vaccination. Testing, if available, will significantly complicate the programme and increase its cost. It will also raise issues of the tests' quality and may trigger rumors about quality and safety of vaccines. In addition, the post-vaccination protective immunity of vaccines depends not only on availability and quantity of virus-neutralizing antibodies, but also on cellular immunity.

3.9 Is a COVID-19 booster shot needed?

> **Version:** *2023-03-17*

Vaccine effectiveness against SARS-CoV-2 infection and mild COVID-19 disease provided by the standard number of primary vaccine doses declines over time, while protection against severe disease and death remains high, including against the Omicron variant.

A booster dose can significantly restore immune responses, particularly in older adults. Vaccine effectiveness studies for booster doses are published by an increasing number of countries, but remain limited in follow-up time. All studies demonstrate an improvement in protection against severe disease and death.

WHO recommends that countries offering a booster dose should focus first on the most vulnerable groups and healthcare workers to minimize the risk of increased severe cases and deaths, and maximize the resilience of health care services.

Update (March 2023):

A first booster dose is administered usually 4–6 months after completion of the primary series. Booster doses can be a vaccine with the ancestral strain, or a vaccine incorporating a variant strain. As vaccine effectiveness wanes over a period, a second booster dose also should be offered 4–6 months after the last dose or, if this time period is missed, as soon as possible thereafter, especially for priority groups at highest risk.

3.10 Are COVID-19 vaccines effective against new variants of concern of the SARS-CoV-2 virus?

> **Version:** *2021-12-17*

Rapid development of efficacious COVID-19 vaccines is one of the few true success stories from this pandemic. Vaccines remain so far effective against severe disease caused by all variants of concern, despite some drops in preventing mild forms of disease.

All viruses, including SARS-CoV-2, the virus that causes COVID-19, change over time. Although most changes have little to no impact on the virus' properties, some may affect how easily it spreads, the associated disease severity, or the performance of vaccines, therapeutic medicines, diagnostic tools, or other public health and social measures.

Variants that pose an increased risk to global public health are defined by WHO as variants of interest (VOIs) or variants of concern (VOCs). A Variant of Interest can become a Variant of Concern if it proves to be a greater threat as demonstrated by international spread, greater disease severity, immune escape or ability to out-compete other strains. The classification of viruses enables the global community to prioritize monitoring and research, and ultimately to inform the ongoing response to the COVID-19 pandemic.

The following have been classified as variants of concern:

- The Alpha variant (B.1.1.7) is known to increase viral transmissibility and was previously the predominant variant in Europe. This variant has been described as having little escape from previous immunity.

- The Beta (B.1.351) variant is less easily neutralized by convalescent plasma obtained from patients infected with previous variants, and preliminary evidence suggests reduced efficacy of some vaccines against mild to moderate disease.
- The Gamma (P.1) variant can cause severe disease even in people who have been previously infected, although this information needs to be expanded with further studies. Similarly, moderate escape from the immune response has been described with this variant.
- The Delta (B.1.617.2) variant is more transmissible than previous variants and as of December 2021 is the dominant variant in the European Region.
- The Omicron (B.1.1.529) variant has a large number of mutations, some of which are concerning. It has been detected at faster rates than previous surges in infection, suggesting that this variant may have a transmission advantage. While characteristics of Omicron are being studied, evidence shows that COVID-19 vaccines are still effective to protect against severe disease due to current circulating SARS-CoV-2 variants, including Delta.

We must remain vigilant and not let down our guard down. While expanding vaccination and making vaccines available, especially to those at highest risk, we must continue public health and social measures, like wearing masks, frequently washing hands and physical distancing.

3.13 Why do immunocompromised people need an additional dose of COVID-19 vaccines?

> **Version:** *2023-03-17*

An additional dose of a vaccine is recommended for immunocompromised people for all COVID-19 vaccines with WHO Emergency Use Listing.

Individuals with immunocompromising conditions and those receiving immunosuppressive therapy often do not develop an adequate immune response to a standard primary series of COVID-19 vaccination. Therefore in these cases an additional dose in the primary series is needed to optimize or enhance the immune response and thereby increase effectiveness against disease.

On the basis of available evidence, the additional dose in an extended primary series should be given at least 1 month and within 3 months after the primary series in order to increase protection for ICPs. If more than 3 months have elapsed since the last dose in the standard primary series, the additional dose in an extended primary series should be given at the earliest opportunity.

3.15 Why are some vaccinated people getting sick with COVID-19 and in some cases being hospitalized?

> **Version:** *2021-11-26*

Most people who get severe COVID-19 disease are unvaccinated. The main aim of COVID-19 vaccines is to protect against severe illness, hospitalizations and deaths, and they do this very well. They also reduce, but cannot eliminate the risk of infection with the virus that causes COVID-19. Since vaccines are not 100%

effective at preventing infection, some people who are fully vaccinated will still get COVID-19. In most cases, these so-called 'breakthrough' infections among people who are fully vaccinated cause mild symptoms. There are increasing data demonstrating a stark distinction in the case outcomes of the unvaccinated compared to the vaccinated. Infection and hospitalization rates for people who are vaccinated are much lower than for people who are not vaccinated.

3.16 Why has Omicron been designated a variant of concern, and can it affect people who are already vaccinated?

> **Version:** *2022-01-18*

WHO designated the variant B.1.1.529 (named Omicron) a variant of concern on 26 November 2021. It has a large number of mutations, some of which are concerning, because they can potentially affect virus characteristics such as transmissibility, disease severity, immune escape, diagnostic or therapeutic escape.

Omicron has been shown to be more transmissible and less severe compared to the Delta variant, especially in those vaccinated. However, it should not be categorized as mild. Vaccines are highly effective in protecting against severe COVID-19 disease and death, including Omicron variant, but they do not eliminate the risk of infection and their effectiveness against symptomatic disease for Omicron variant appears to be reduced. As a result, more vaccinated people are likely to develop a breakthrough infection due to Omicron. However, these studies also show that vaccination continues to provide a high level of protection against severe disease and hospitalization linked to the Omicron variant.

Vaccines will continue to be the most important first line of defense against this disease, and they are especially important for people who are most at risk, including older adults, health workers and people with underlying health conditions.

The best way to prevent infection and serious disease caused by Omicron or any other SARS-COV-2 variant is by getting vaccinated and remembering to also maintain physical distance, wear a mask when distancing is not possible, frequently wash hands and ventilate indoor spaces.

3.17 Will variant-specific vaccines be needed in the near future?

> **Version:** *2022-01-18*

While the Omicron variant is spreading rapidly across the world, the evolution of SARS-CoV-2 is expected to continue and Omicron is unlikely to be the last variant of concern (VOC). The WHO Technical Advisory Group on COVID-19 Vaccine Composition (TAG-CO-VAC) is developing a framework to analyze the evidence on emerging VOCs in the context of criteria that would trigger a recommendation to change COVID-19 vaccine strain composition. The TAG will advise WHO on updated vaccine compositions, as required.

Vaccines that have received WHO Emergency Use Listing, across several vaccine platforms, provide a high level of protection against severe disease and death caused by VOCs. For the Omicron variant, the mutational profile and preliminary data indicate that vaccine effectiveness is reduced against symptomatic disease caused by this variant, but protection against severe disease is more likely to be preserved.

More data on vaccine effectiveness, particularly against hospitalization, severe disease, and death are needed, including for each vaccine platform and for various vaccine dosing and product regimens, before recommendations can be made with respect to possible new vaccine compositions.

3.18 Is the immunity that the current COVID-19 vaccines provide waning over time?

> **Version:** *2023-03-17*

It is common for vaccine-induced immunity to wane over time for some vaccines.

The current WHO-approved vaccines provide substantial protection for at least six months against severe disease, hospitalization and death from COVID-19. This waning has resulted in reduced effectiveness against mild and asymptomatic infection with Omicron and Delta variants, and the need for a booster doses to restore a sufficient level of protection.

WHO has recommended that a booster dose should be offered 4-6 months after completion of the primary series to maintain the high level of protection against severe disease. Furthermore, for people with impaired immune system, an additional dose in the primary series is recommended to mount a proper immune response.

It is important to take all vaccine doses you are offered to maintain the highest level of protection. Consult your health practitioner for the recommended number of doses.

More research is needed to continue evaluating vaccine effectiveness beyond six months, and following administration of a booster dose.

3.22 Can COVID-19 vaccines stop transmission of Omicron and its subvariants?

> **Version:** *2022-06-27*

The initial Omicron variant of the SARS-CoV-2 virus and five groups of Omicron subvariants (BA.1, BA.2, BA.3, BA.4 and BA.5) can infect people who have been vaccinated against COVID-19. Fortunately, fully vaccinated people will generally experience only mild disease. To prevent serious disease and deaths, it is therefore critical that everyone who is eligible receives the recommended number of COVID-19 vaccine doses, especially those in high risk groups, including older adults.

4 Co-administration, dose-interval and interchangeability

4.2 Can a person receive different vaccines for the first, second and/or booster doses?

> **Version:** *2022-11-07*

> **Tags:** *interchangeability*

Achieving high vaccination coverage of priority groups should be the focus of national immunization programmes, using either the same vaccine for the different doses (homologous schedule) or different vaccines (heterologous schedules).

Interchangeability of vaccine platforms for adults allows for flexibility, for example in the face of constrained or unpredictable supply. However, until sufficient evidence is available on interchangeability of paediatric formulations of COVID-19 vaccines, it remains standard practice to use the same product to complete primary schedule for children (<12 y.o.).

Variant-containing vaccines have been approved for use as booster doses. Until supportive evidence or regulatory approval becomes available, they should not be used as the primary series.

4.8 Can COVID-19 and influenza (or other) vaccines be administered to a person during the same visit?

> **Version:** *2021-11-26*

Administration of both COVID-19 and seasonal influenza vaccines during the same visit would have several benefits - by reducing the number of health care visits needed, providing timely protection against both diseases; and by decreasing the overall burden on health services.

Limited evidence now suggests that coadministration of COVID-19 vaccines with inactivated vaccines is acceptable in terms of immunogenicity and reactogenicity.

Therefore, WHO considers that coadministration of an inactivated seasonal influenza vaccine and any dose of a COVID-19 vaccine is acceptable, given that the known risk of serious illness for adults infected with influenza virus or SARS-CoV-2 is substantial. While there is no theoretical concern, WHO recommends using the contralateral limb for injection, when the two vaccines are administered during the same visit, to minimize any perceived risk. Continued pharmacovigilance monitoring of coadministration of the two vaccines is recommended[1].

4.10 Is there a minimum and maximum time interval between COVID-19 vaccine doses?

[1] Coadministration of seasonal inactivated influenza and COVID-19 vaccines: interim guidance, 21 October 2021. https://apps.who.int/iris/handle/10665/346897

> **Version:** *2023-03-17*

For timely protection, it is best to get vaccine doses within the recommended time interval. WHO recommends an interval of 8 to 12 weeks between the primary vaccination doses.

There is no maximum limit to receive the second or subsequent doses; it is never too late to get the missed dose if a delay cannot be avoided. The minimum recommended interval between doses should not be reduced because it is important to allow sufficient time for the immune system to mount a response.

Update (March 2023):

As a general principle, an interval of 4–6 months between completion of a primary series and administration of a first booster dose, and between booster doses. could be considered.

5 Safety

5.2 How are we going to monitor vaccine safety?

> **Version:** *2021-04-14*

> **Tags:** *AEFIs, adverse events, vaccine safety, safety, monitor*

Although modern vaccines are safe, the increased number of doses and opportunities for vaccination may lead to vaccine safety concerns. Assured quality vaccines are essential to effective immunization programmes.

Monitoring vaccine safety is a complex and shared responsibility. It can be carried out in many ways: large post-approval clinical trials, record linkage studies that track health care visits following vaccinations, or more targeted follow-up studies such as those using health diaries. However, the cornerstone of surveillance systems in most countries is active and passive reporting schemes that rely on the vigilance of health care providers and the reporting of individual cases of adverse reactions.

As part of safety monitoring we are also looking for vaccine safety "signals" – new events which have not been previously known to be caused by the vaccine. or a potential increase in frequency of a known event in recipients of the vaccine as compared to those who have not received it.

A standardized evaluation instrument known as the causality assessment form has been developed to establish causality. This form assesses different points: biological plausibility, the time elapsed between the vaccine administration and onset of the adverse event, and whether other factors could account for the adverse symptoms. The form concludes with a consensus assessment causality, a commentary about the assessment, and advice for further study or follow-up.

5.6 Are adverse effects observed significantly higher following the second dose (or booster doses) as opposed to the first dose for the mRNA vaccines?

> **Version:** *2022-01-18*

> **Tags:** *AEFIs, adverse events, safety*

Reactogenicity and adverse events were generally milder and less frequent in clinical trial participants in the older group (≥55 years of age) compared with the younger group (18-55 years of age) and tended to increase after the second dose for the mRNA vaccines. Reactogenicity was mostly mild to moderate and short-lived after dosing for both adult age groups (median onset was 0-2 days after either dose for a median duration of 1-2 days).

Safety and reactogenicity studies of booster doses are based on small-scale clinical trials and post-licensure data with limited follow-up. Overall, they show a similar safety profile to that observed after the second dose in the primary series.

5.7 Should a person who was previously infected with COVID-19 still be vaccinated?

> **Version:** *2021-12-17*

Vaccination may be offered regardless of a person's history of symptomatic or asymptomatic SARS-CoV-2 infection.

Vaccination is still important following natural infection, as it can boost the person's immunity and provide added protection against reinfection.

Persons with PCR-confirmed SARS-CoV-2 infection should be vaccinated after they are no longer in isolation and do not have a fever.

WHO does not recommend pre-vaccination screening for prior infection.

5.8 Can COVID-19 vaccination affect fertility?

> **Version:** *2021-04-14*

> **Tags:** *fertility, pregnancy*

There is no evidence that the immune response to coronaviruses has any impact on fertility in animals or humans, and there is no biological mechanism that has been shown to result in an impact on fertility. There is also no evidence to suggest that COVID-19 vaccines cause infertility. There are no licensed vaccines of any type that cause infertility.

WHO does not recommend pregnancy testing prior to vaccination. WHO does not recommend delaying pregnancy following vaccination.

5.10 Under what circumstances should a COVID-19 vaccine be recalled?

> **Version:** *2021-04-14*

Although every vaccine goes through three phases of clinical testing before being used, vaccines or vaccine lots (specific batches) can be withdrawn or recalled after being deployed to countries. Vaccine recalls or withdrawals due to safety issues are very rare.

Recalls are usually initiated voluntarily by a vaccine manufacturer, if as part of their continuous monitoring of the quality of vaccine production they find an irregularity affecting a specific batch of vaccines. Sometimes, health authorities may temporarily suspend or withdraw a specific vaccine batch as a precaution while they investigate a severe acute event following immunization or a cluster of adverse events.

In most cases, a person who had been vaccinated with a vaccine from a recalled batch will not need to do anything after the vaccine is recalled. If the vaccine recall is related to a possible safety concern, people who were vaccinated should talk to their doctor if they have any concerns that they may be having a reaction. If a vaccine recall is due to low vaccine effectiveness, people who were vaccinated with a vaccine from that lot or batch might need to be vaccinated again to ensure they are protected against the disease.

5.11 What happens if a serious side effect is reported?

> **Version:** *2021-04-14*

As with any vaccine, it is essential to closely monitor the safety and effectiveness of COVID-19 vaccines as they are delivered. If a problem is reported following vaccination, health authorities will perform a thorough investigation to assess if the reported side effect is causally related to the vaccination.

During these investigations, it is extremely rare that health problems are found to be caused by the vaccine itself. Adverse events are most often found to be coincidental in time with the vaccination and may be entirely unrelated to vaccination. Sometimes they are related to how the vaccine has been stored, transported, or administered.

In the very rare cases where a genuine adverse reaction is suspected or there is an accumulation of reported side effects, the vaccine (or the specific vaccine batch) may be suspended from use. Further investigations will take place to determine what exactly caused the event, and corrective measures will be put in place. WHO works with vaccine manufacturers, health officials and other partners to continuously monitor any safety concerns and potential side effects on an ongoing basis.

5.13 Why children were not initially included in clinical trials?

> **Version:** *2022-04-07*

The burden of COVID-19 is significantly lower in children than in adults; the vast majority of hospitalizations and deaths caused by COVID-19 have occurred in the adult population, in particular elderly people. For these reasons, the development of the vaccines targeting the adult population was the first priority. Once we learned vaccines are safe and efficacious in adult populations, clinical trials were expanded gradually to include youth and children. Clinical trials to test the safety and efficacy of the COVID-19 vaccine in young children underwent a rigorous process, and were required to meet the same standards as for other vaccines such as polio or measles.

Clinical trials designed for children — and pharmaceutical products tested in children — are the only way to develop age-specific, scientifically tested vaccines and treatments for this unique population.

5.14 What do WHO and EMA mean when they say the benefits outweigh the risks of vaccination?

> **Version:** *2021-04-14*

WHO and EMA have assessed available data and determined that the benefits of vaccination, namely the tremendous potential to prevent infections and reduce deaths across the world, outweigh the possible but very small risk of suffering any serious adverse event following vaccination.

Concretely in the case of severe thromboembolic events and thrombocytopenia association, irrespective of the existence or not of a causal link with vaccination, the noted frequency is less than 1 per 100.000 doses administered to date[2].

[2] https://www.who.int/news/item/16-04-2021-global-advisory-committee-on-vaccine-safety-(gacvs)-review-of-latest-evidence-of-rare-adverse-blood-coagulation-events-with-astrazeneca-covid-19-vaccine-(vaxzevria-and-covishield)

5.17 Do mRNA vaccines cause myocarditis as an adverse reaction?

> **Version:** *2021-09-20*

Fever, headache, muscle pain and pain at the injection site remain the most common adverse reactions identified following COVID-19 vaccination. However, cases of myocarditis/pericarditis (inflammation of the heart muscle) and pericarditis (inflammation of the membrane surrounding the heart) following COVID-19 vaccination have been reported. While they can lead to serious illness, they are often mild and respond well to conservative treatment. They have typically occurred within days of vaccination, more commonly among younger males and more often following the second dose of COVID-19 mRNA vaccines. It is important to remember that the frequency of myocarditis/pericarditis following natural infection of SARS-COV-2 is much (about six times) higher than in vaccinated subjects.

To date, due to the limited number of cases as well as their favorable prognosis, the Pharmacovigilance Risk Assessment Committee (PRAC) of the European Medicines Agency, COVID-19 subcommittee of the WHO Global Advisory Committee on Vaccine Safety (GACVS) and the US Advisory Committee on Immunization Practices (ACIP) have concluded that the benefits of mRNA COVID-19 vaccines in reducing hospitalizations and deaths due to COVID-19 infections continue to outweigh the risks of myocarditis and pericarditis even among young people.

Clinicians should be aware of the rare risk of myocarditis and pericarditis with mRNA vaccines and those most likely to be affected. They should be alert to presentations such as acute chest pain, shortness of breath and palpitations that may be suggestive of myocarditis after vaccination, especially in adolescent or young males. All health professionals are encouraged to report all events of myocarditis and other adverse events observed with these and other vaccines. The GACVS COVID-19 subcommittee will continue to review the safety data from all COVID-19 vaccines and update any advice as necessary.

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Summary:

- Rare cases of myocarditis/pericarditis and pericarditis following COVID-19 vaccination have been reported. They are usually mild and respond well to treatment.
- The reported cases have typically occurred within days of vaccination, more commonly among younger males and more often following the second dose the of COVID-19 mRNA vaccines.
- The benefits of mRNA COVID-19 vaccines in reducing hospitalizations and deaths due to COVID-19 infections continue to outweigh the risks of myocarditis and pericarditis even among young people.

5.18 Why have some women experienced changes to their menstrual cycle following COVID-19 vaccination and can this affect fertility?

> **Version:** *2022-05-23*

There is no evidence whatsoever that COVID-19 vaccination could affect fertility. There have been some reports on minor and temporary changes to women's menstrual cycle following vaccination. More research is being conducted to understand whether there is a causal link and potential mechanisms involved, for example whether vaccination causes an immune response that might temporarily influence the menstrual cycle. In any case, with the currently available evidence there is no reason to link COVID-19 vaccination and fertility issues.

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5.19 Can COVID-19 vaccination lead to impotence?

> **Version:** *2021-11-26*

WHO recommends COVID-19 vaccines to all people in the eligible age groups, including those who plan to have children. There is no scientific evidence that any vaccines, including COVID-19 vaccines, affect fertility in women or men. Likewise, there is no evidence nor biologic plausibility that COVID-19 vaccines could cause impotence. For these reasons, no specific contraindication, precaution or alert exists linking vaccination and impotence.

5.20 Can COVID-19 vaccination during pregnancy cause birth defects?

> **Version:** *2021-11-26*

Over 6 billion doses of COVID-19 vaccine doses have been administered globally. There have been no vaccine safety signals identified on potential increase of incidence of birth defects in babies of vaccinated persons. Congenital malformations can occur no matter of whether a person has received vaccination against COVID-19. Therefore, since billions of doses of COVID-19 vaccines have been administered globally, the chance that such a rare event could coincide in time with vaccination is high.

Pregnant women are at high risk of severe illness from COVID-19. The risk presented by COVID-19 disease is much higher than any potential risk of COVID-19 vaccination, including during pregnancy.

5.21 Could there be as yet unidentified side effects of the vaccines?

> **Version:** *2021-11-26*

After the successful completion of phase III trials and after the product is licensed, phase IV studies, also called post-marketing surveillance studies, are used to continue monitoring the safety and effectiveness of the vaccine once applied to the population. Phase IV constitutes the expansion of knowledge about the efficacy of the vaccine once it has been approved for commercialization and begins to be applied systematically in the population. In addition to the very rare adverse reactions that could occur with its use and that had not been detected in the previous phases, the effectiveness is also evaluated through continuous epidemiological surveillance.

Billions of doses of COVID-19 vaccines have been administered globally in 2021. Thanks to robust surveillance systems, some very rare, previously unidentified adverse effects have been reported following widespread use of COVID-19 vaccines. Very rare cases of anaphylaxis have been reported with the most COVID-19 vaccines – anaphylaxis is treatable if recognized early and treated promptly.

Very rare cases of myocarditis and pericarditis have been observed following vaccination with mRNA vaccines, mostly after the second dose of vaccination, and more commonly in younger men. Myocarditis and pericarditis are mild in most cases and resolve with treatment and rest.

A small number of very rare thromboembolic events, in combination with thrombocytopenia, have been reported following vaccination with AstraZeneca and Johnson & Johnson vaccines.

Rare cases of Guillain-Barré Syndrome (GBS) have also been reported following vaccination with these two vaccines. WHO has reviewed all evidence on these rare events and concluded that the benefits of these vaccines in preventing severe illness and deaths far outweigh the small risks. In addition, WHO and countries are conducting research and implementing actions to mitigate further those small risks.

All COVID-19 vaccines will continue to be monitored closely and WHO will review all robust evidence related to their safety and effectiveness to ensure COVID-19 vaccination programmes are as safe as possible.

5.22 Is there a limit to the number of vaccine doses a person can safely receive?

> **Version:** *2022-01-18*

This is not known. However, no safety concern is raised at the moment regarding the administration of several vaccine doses. Nevertheless, the strategy of COVID-19 vaccination programmes in the future will depend on several factors including evolution of the virus (e.g. severity of the disease in relation to effectiveness of vaccination), programme objectives and feasibility.

5.23 Is it safe to vaccinate older adults who have chronic medical conditions (such as diabetes or hypertension)?

> **Version:** *2022-02-11*

The risk of developing severe disease, from any variant of the SARS-COV-2 virus, increases with age and is higher for people who are immunocompromised and/or have underlying conditions including diabetes, hypertension, and obesity.

It is especially important that all people in these high-risk groups receive all recommended doses of COVID-19 vaccine to provide the best possible protection against severe disease, hospitalization and potentially also death.

In general, only persons with a severe allergic reaction (anaphylaxis) to the first dose should not receive additional doses of the same vaccine.

5.24 Can COVID-19 vaccines cause AIDS?

> **Version:** *2022-04-07*

No. There is no evidence from clinical trials or from the field following worldwide use of currently available COVID-19 vaccines that COVID-19 vaccination causes any type of immunosuppression in any population group.

It is not possible for COVID-19 vaccines to cause AIDS, which is caused by the Human Immunodeficiency Virus (HIV). Suggestions that COVID-19 vaccination can cause a similar immunosuppressed outcome, which some have dubbed “VAIDS”, are not based on any observed or reported evidence.

5.25 Do the COVID-19 vaccines weaken the immune system?

> **Version:** *2022-04-07*

No. Vaccines prepare the immune system to fight the virus. Billions of doses of COVID-19 vaccines have been administered worldwide and they have shown to be very effective in preventing severe COVID-19 disease. If COVID-19 vaccines weakened the immune system people who are vaccinated against COVID-19 would have more severe disease. This is not the case.

In the European Region, a recent study has shown that about 500,000 lives have been saved through vaccination among adults over 60 in 33 countries. The vast majority of people requiring intensive care in hospitals for COVID-19 have been unvaccinated.

5.26 Why are some countries vaccinating children?

> **Version:** *2022-04-07*

The primary public health objectives of COVID-19 vaccination is to reduce severe disease and deaths and to maintain essential services.

This is why the highest priority in every country should be to vaccinate:

- Individuals at highest risk of severe outcomes (immunocompromised individuals of any eligible age, including children from age 5; older adults; residents of long-term health care facilities; people with underlying health conditions; and disadvantaged socio-demographic groups, including refugees);
- close contacts of immunocompromised persons;
- identified essential services workers (e.g., front line health and social care workers and school teachers).

Countries that have reached high uptake with primary doses and a booster dose in the highest priority population groups, and that have the financial and programmatic means to do so can offer an approved paediatric formulation of COVID-19 vaccine to children aged 5-11.

In deciding whether to offer vaccines to healthy children from age 5, countries must consider the balance of benefits and risk of COVID-19 vaccination in this age group in their epidemiological context.

- COVID-19 is generally less severe in healthy children aged 5–11 years, but it can occasionally result in serious disease.
- Clinical trials to test the safety and efficacy of the COVID-19 vaccine in young children underwent a rigorous process, and were required to meet the same standards as for other vaccines.

6 Vaccination recommendations, precautions, or contraindications for special groups

6.2 Can people with allergies be vaccinated with mRNA vaccines?

> **Version:** *2022-01-18*

> **Tags:** *allergy, allergic reactions, anaphylaxis, mRNA vaccines, contraindications, precautions, safety*

These vaccines are contraindicated in the following cases:

- Severe allergic reaction (e.g. anaphylaxis) after a previous dose of a COVID-19 vaccine or due to any of the vaccine components.

A history of any immediate allergic reaction to any other vaccine or injectable therapy (i.e. intramuscular, intravenous, or subcutaneous vaccines or therapies) is considered as a precaution but not a contraindication to vaccination. For such persons, a risk assessment should be conducted to determine the type and severity of reaction and the reliability of the information. Such individuals may still receive vaccination, but they should be counseled about the risks of developing a severe allergic reaction, and the risks should be weighed against the benefits of vaccination. Such persons should be observed for 30 minutes after vaccination in health care settings where anaphylaxis can be immediately treated.

Food, contact, or seasonal allergies are not considered reasons for precaution. The vial stoppers are not made with natural rubber latex, and there is no contraindication or precaution to vaccination for persons with a latex allergy. In addition, mRNA vaccines do not contain eggs or gelatin, and there is no contraindication or precaution to vaccination for persons with allergies to these substances.

People with a family history of allergies or anaphylaxis can be vaccinated.

6.3 Should a person who experienced an allergic reaction to the 1st dose of COVID-19 vaccine receive a second dose?

> **Version:** *2022-01-18*

> **Tags:** *allergy, allergic reactions, anaphylaxis, contraindications, precautions, safety*

In general, persons with a severe allergic reaction (anaphylaxis) to the first dose should not receive additional doses of the same vaccine.

As a small number of anaphylactic reactions have also been reported in vaccinees without a history of severe allergic reactions, WHO recommends that COVID-19 vaccines should be administered only in settings where anaphylaxis can be treated. Until more data and insights are available with regard to severe allergic reactions to COVID-19 vaccination, all vaccinees should be observed for at least 15 minutes after vaccination.

6.4 Can immunocompromised people be vaccinated?

> **Version:** *2023-03-17*

> **Tags:** *immunocompromised, immunosuppressive therapy, contraindications, precautions, safety, effectiveness*

Vaccines are considered safe in this population group, although the immune response may be lower than usual in the general population.

Immunocompromised people (including people living with HIV, regardless of the CD4+ count) or people receiving immunosuppressive therapy (including corticosteroids that can be used in the COVID-19 treatment) may have an increased risk of suffering severe COVID-19. No discontinuation of immunosuppressive therapy is recommended.

In the case of vaccines that do not contain live viruses, such as mRNA vaccines and vector vaccines, convalescent plasma or monoclonal antibodies used for COVID-19 treatment would not contraindicate vaccine reception, although to prevent interference with the immune response to the vaccine, it is advisable to delay vaccination at least 90 days.

People who are immunocompromised should receive an additional dose of a COVID-19 vaccine in the primary schedule to provide more opportunity for them to build a sufficient immune response.

Update (March 2023):

Immunocompromised people are among the highest priority groups for which booster doses are recommended.

6.5 Is there a maximum age for vaccination?

> **Version:** *2021-06-29*

> **Tags:** *contraindications, precautions, age, vaccines, Comirnaty, mRNA vaccines, vector vaccines, AstraZeneca, Janssen, elderly, frail population*

Vaccination is recommended for older persons without an upper age limit. Persons above the age of 85 years and very frail older persons were not included in the clinical trials. However, the data obtained in a large subset of older people with and without comorbidities suggest that the benefits of vaccination outweigh the potential risks. For very frail older persons with a life expectancy anticipated to be less than 3 months, an individual risk–benefit assessment will need to be conducted.

- Age recommendations differ per vaccine.
- No maximum age has been recommended by producers.

6.6 Can approved COVID-19 vaccines be administered to people with coagulant disorders or chronic treatment with anticoagulants?

> **Version:** *2021-12-17*

> **Tags:** *coagulant disorders, chronic treatment, anticoagulants, precautions, safety, mRNA vaccines, Comirnaty, mRNA-1273, Moderna, Pfizer-BioNTech, vector vaccines, AstraZeneca, Janssen*

In people with coagulation disorders, except for a specific medical criterion, small-volume intramuscular injections, such as the ones used for vaccination, can be applied with reasonable security. The use of a 0.5 or 0.6 mm (25G or 23G) fine needle, and after vaccination maintaining pressure at the injection site (without scrubbing) for 2 minutes, is recommended. In any case, the person being vaccinated must be informed about the possibility of a hematoma at the injection site.

People on chronic treatment with anticoagulants, who are under control and have a stable INR, can receive intramuscular vaccination without any problem.

If there is any doubt, a doctor should assess the individual case to determine the possibility of getting (or giving) the vaccine.

6.9 When should a woman planning to get pregnant be vaccinated?

> **Version:** *2021-04-14*

> **Tags:** *pregnancy*

Pregnant women are at higher risk of severe COVID-19 compared with women of childbearing age who are not pregnant, and COVID-19 has been associated with an increased risk of preterm birth.

WHO does not recommend delaying pregnancy following vaccination nor pregnancy testing prior to vaccination.

6.10 Are there any chronic hematological diseases that would be a contraindication for COVID-19 vaccination?

> **Version:** *2022-01-18*

No studies have demonstrated an increased likelihood of vaccine-induced thrombosis and thrombocytopenia (VITT) or other thrombotic complications following vaccination of individuals with prior thrombosis or increased thrombotic risk. Therefore, restriction of the use of the vaccine in patients with risk factors for thrombosis is not indicated at this time.

Very rare (less than one in a million vaccinated to date) cases of serious thrombosis associated with thrombocytopenia, sometimes with bleeding and disseminated intravascular coagulation, have been reported

including several cases of cerebral venous sinus thrombosis. Most have occurred within 14 days after vaccination. However, we do know that COVID-19 disease itself is associated with an increase in thrombotic events and that such events have been documented in patients with asymptomatic COVID-19 disease. Similar conditions (unrelated to COVID-19 or COVID-19 vaccination) can be triggered by an immune response against platelets in heparin-induced thrombocytopenia, resulting in aggregation, thrombosis, and platelet penia.

6.11 I have had a blood clot in the past or I have a family history of blood clotting. Should I still get vaccinated against COVID-19?

> **Version:** *2021-04-14*

You can still get any of the licensed COVID-19 vaccines, including the Oxford-AstraZeneca COVID-19 Vaccine if you have recently had a blood clot, take blood thinning medicine or have a family history of blood clotting. You do not need to cancel or delay vaccination. You should also not receive any antiplatelet or anticoagulant treatment in the days before or after vaccination if it was not previously prescribed by your physician because of your illness. A vaccinated person, regardless of the vaccine used, should continue the usual treatment he or she may receive (including any antithrombotic treatment).

Like everyone who gets the vaccine, you should be aware of the symptoms to look out for and seek urgent medical care if you have any signs or symptoms of blood clotting, such as shortness of breath, chest pain, leg swelling, persistent abdominal pain following vaccination. Additionally, anyone with neurological symptoms including severe or persistent headaches and blurred vision after vaccination, or who experience skin bruising (petechia) beyond the site of vaccination after a few days, should seek prompt medical attention.

6.12 I am using a hormonal contraception method (oral contraceptives, subdermal implant, skin patches or vaginal ring): should I discontinue this treatment before or after receiving AstraZeneca vaccines?

> **Version:** *2021-04-14*

Although it is true that hormonal contraceptives have an associated risk of thrombotic events, withdrawal of these methods is not recommended at any stage of the COVID-19 vaccination process with any of the currently available vaccines.

6.13 Is COVID-19 vaccination safe and recommended for people who have a liver condition?

> **Version:** *2022-07-16*

Vaccines are safe, effective and should be provided to people with chronic liver disease (CLD), independent of the cause and the severity of the liver disease. This includes people with cirrhosis or liver decompensation, hepatobiliary cancer, and liver transplant recipients.

People with CLD have a greater risk of being hospitalized, requiring intensive care, intubation and/or ventilation and of dying from COVID-19. Because of this increased morbidity and mortality, it is important that

these individuals, their household contacts and healthcare providers receive COVID-19 vaccination. There is no evidence to suggest that COVID-19 vaccines have any negative impact on a person who has CLD.

Current COVID-19 vaccines continue to exhibit strong protection against severe disease and death across all virus variants seen to date. Therefore, reaching high coverage with the primary vaccination series and additional doses among all eligible people, especially the most vulnerable, remains a priority.

Medically stable patients with CLD who are receiving antiviral therapy for hepatitis B or hepatitis C or other medical therapy should be considered for COVID-19 vaccination without interruption of their treatment.

Patients with CLD will benefit from extended protection against both COVID-19 and influenza disease by co-administration of COVID-19 vaccines and seasonal influenza vaccines, whenever feasible.

Individuals who have had COVID-19 still benefit from vaccination against the disease because a combination of naturally acquired and vaccine-induced immunity is likely to offer greater protection against re-infection.

6.14 Is COVID-19 vaccination safe and recommended for people who have chronic liver disease and are immunocompromised (have a weakened immune system)?

> **Version:** *2022-07-16*

Some people with chronic liver diseases may have an impaired immune system or may receive immunosuppression treatment. Immunocompromised people are at increased risk of severe COVID-19 illness and death. All WHO emergency use listed vaccines provide significant protection from severe COVID-19 disease and are safe for people who are immunocompromised.

The immune response to COVID-19 vaccination and the gained protection in immunocompromised people may not be as strong as compared with the rest of the population. Therefore, immunocompromised individuals and their close contacts should receive an extended (3-dose) primary vaccination series followed by a first and second booster dose administered at an interval of 3–6 months.

Reported research data do not support the idea that COVID-19 vaccination induces autoimmune hepatitis (AIH).

6.15 Should a person with liver cirrhosis be vaccinated against COVID-19?

> **Version:** *2022-07-16*

All WHO Emergency use listed COVID-19 vaccines are safe and recommended for people with cirrhosis.

Getting a COVID-19 vaccination may be especially important for people with liver cirrhosis, because they are at increased risk should they be exposed to COVID-19.

6.16 Should a person who is a candidate for, or who has had, a liver transplant be vaccinated against COVID-19?

> **Version:** *2022-07-16*

People who need or have had a liver transplant are more likely to get very sick if they get COVID-19.

Liver transplant candidates should receive COVID-19 vaccination prior to transplantation whenever possible to help ensure an adequate immune response.

Those who have had a liver transplant and are on anti-rejection drugs can and also should get vaccinated against COVID-19.

It is not recommended to withhold immunosuppression prior to or after COVID-19 vaccine administration.

6.17 Does getting a COVID-19 vaccine during pregnancy protect the baby from the virus after delivery?

> **Version:** *2022-08-03*

Having a COVID-19 infection while pregnant increases the chance of severe illness and pregnancy complications. Studies have shown that pregnant women who are vaccinated are less likely to get very sick with COVID-19. Therefore COVID-19 vaccination is recommended for women who are pregnant, trying to get pregnant now, or who might become pregnant in the future, to protect them from COVID-19. It is also recommended for women who are breastfeeding.

Infants are at risk for life-threatening complications from COVID-19, including acute respiratory failure. Recent studies of COVID-19 vaccination during pregnancy suggest the possibility of transplacental transfer of SARS-CoV-2–specific antibodies from the mother to her baby. As in the case of other vaccine-preventable diseases, maternal immunization can provide protection to infants against COVID-19, especially during the high-risk first 6 months of life, through passive transplacental antibody transfer.

In summary, research data show that COVID-19 vaccination during pregnancy might help prevent COVID-19 hospitalization of both pregnant women and their infants.

https://www.cdc.gov/mmwr/volumes/71/wr/mm7107e3.htm

6.18 Does getting a COVID-19 vaccine increase the chance of birth defects?

> **Version:** *2022-08-03*

Every fetus in early pregnancy starts out with a 3-5% chance of having a birth defect. This is called the background risk. The available studies have not found an increased chance of birth defects when a pregnant woman receives a COVID-19 mRNA vaccine during the first trimester. Growing evidence shows that COVID-19 vaccination during pregnancy can benefit both the mother and her child. It also shows that COVID-19 vaccination during pregnancy does not harm the fetus, and that vaccination prior to pregnancy does not reduce female fertility. Vaccination is protective and much safer than COVID-19 infection.

6.19 Does getting a COVID-19 vaccine make it harder to get pregnant or affect fertility treatments?

> **Version:** *2022-08-03*

There is no evidence that getting a COVID-19 vaccine makes it harder to get pregnant. Several studies of people undergoing in-vitro fertilization (IVF) found that getting a COVID-19 mRNA vaccine did not affect the body functions responsible for fertility. Professional associations for reproductive medicine recommend that people undergoing fertility treatment stay up to date on recommended COVID-19 vaccines and boosters. There is no recommendation to postpone fertility treatment after getting the vaccine nor to avoid getting the vaccine after treatment.

6.20 Does getting a COVID-19 vaccine increase the chance of miscarriage?

> **Version:** *2022-08-03*

Having a COVID-19 infection while pregnant increases the chance of severe illness and pregnancy complications. It is therefore especially important to be fully vaccinated against this disease when pregnant.

Miscarriage can occur in any pregnancy. Studies have found that getting a COVID-19 mRNA vaccine during pregnancy does not increase the chance of miscarriage.

References:

- https://mothertobaby.org/fact-sheets/covid-19-mrna/
- https://mothertobaby.org/fact-sheets/covid-19-viral-vector-vaccine/
- https://mothertobaby.org/fact-sheets/covid-19-protein-subunit-vaccine/

6.21 Should a woman wait for a certain period to get pregnant after being vaccinated against COVID-19?

> **Version:** *2022-08-03*

Since COVID-19 vaccines do not contain live virus, there is no recommendation to wait before trying to get pregnant.

6.22 Does getting a COVID-19 vaccine during pregnancy increase the chance of pregnancy-related problems?

> **Version:** *2022-08-03*

Studies have found no increased chance for pregnancy or newborn complications, such as stillbirth, preterm delivery (before 37 weeks of pregnancy), babies born smaller than expected, low Apgar scores, neonatal intensive care unit admission, or neonatal death, when a COVID-19 vaccine is given anytime during pregnancy. The majority of women in these studies received mRNA vaccines (Moderna/Spikevax® or Pfizer/Comirnaty®).

6.23 Does getting a COVID-19 vaccine during pregnancy affect the fetus' future behaviour or learning ability?

> **Version:** *2022-08-03*

It will take time to follow the children of women who were vaccinated during pregnancy in order to answer this question. However, based on what is known about these and other vaccines, getting a COVID-19 vaccine is not expected to cause short- or long-term problems for the child.

6.24 Should a breastfeeding woman be vaccinated against COVID-19?

> **Version:** *2022-08-03*

Yes. Organizations including the Academy of Breastfeeding Medicine and the American Academy of Pediatrics agree that women who are breastfeeding can receive COVID-19 vaccines – because it is safe for them and their babies. There is no recommendation to postpone breastfeeding or discard breast milk after getting the vaccine.

Small studies have found that mRNA from the vaccines is unlikely to enter the breast milk. If any small amounts of vaccine ingredients did enter the breast milk, they would most likely be destroyed in the baby's stomach.

Studies have not reported serious adverse reactions to the vaccine in women who are breastfeeding nor their infants. Less than 10% of breastfeeding women in the studies reported changes in milk supply (more or less milk) after getting the vaccine, and their supply returned to normal within a day or two.

Antibodies against the virus that causes COVID-19 have been found in the breastmilk of breastfeeding women who have been vaccinated. More research is needed to know to what extent these antibodies might protect a breastfeeding child against the virus and how long that protection might last.

Breastfeeding women, or those who are planning to breastfeed, are encouraged to talk to their healthcare providers about all of their breastfeeding questions.

WHO's Science in 5, COVID-19: vaccines, pregnancy, menstruation, breastfeeding, fertility - 4June21 - YouTube: https://www.youtube.com/watch?v=B8Mb-zPltG8

6.25 Are extra precautions needed while breastfeeding following COVID-19 vaccination?

> **Version:** *2022-08-03*

If a woman is vaccinated against COVID-19, she does not need to take any special precautions when feeding her baby at the breast or expressing milk. However, if she has symptoms of COVID-19 or has had close contact with someone who has the illness, WHO recommends that she:

- wash hands frequently with soap and water or use alcohol-based hand rub and especially before touching the baby;

- wear a medical mask during any contact with the baby, including while feeding;
- sneeze or cough into a tissue, then dispose of it immediately and wash hands again;
- routinely clean and disinfect surfaces that others have touched.

It is important to replace medical masks as soon as they become damp and dispose of them immediately. Masks should not be reused or touched in the front.

Coronavirus disease (COVID-19): Breastfeeding (who.int): https://www.who.int/news-room/questions-and-answers/item/coronavirus-disease-covid-19-breastfeeding

6.26 Can a person with a thyroid condition be vaccinated against COVID-19?

> **Version:** *2022-09-20*

People with some underlying medical conditions, including thyroid disorders, are more likely to become severely ill if infected with COVID-19. Current COVID-19 vaccines continue to exhibit strong protection against severe disease and death across all virus variants seen to date. Therefore, reaching high coverage with the primary vaccination series and additional doses among all eligible people, especially the most vulnerable, remains a priority.

People with thyroid conditions, including autoimmune thyroid disease and thyroid cancer, should receive a COVID-19 vaccine. Consult your doctor for further questions and personal advice related to your individual circumstances.

6.27 Is COVID-19 vaccination safe and recommended for people who have diabetes?

> **Version:** *2022-09-20*

People with some underlying medical conditions, including diabetes, are more likely to become severely ill if infected with COVID-19. Current COVID-19 vaccines continue to exhibit strong protection against severe disease and death across all virus variants seen to date. Therefore, reaching high coverage with the primary vaccination series and additional doses among all eligible people, especially the most vulnerable, remains a priority.

Individuals with diabetes should be aware that any vaccination may make blood sugar levels go up - the body needs energy to produce an immune response, so it may release some extra glucose (sugar).

Consult your doctor for further questions and personal advice related to your individual circumstances.

6.28 Is COVID-19 vaccination safe and recommended for people who have intellectual and/or developmental disabilities (such as attention deficit disorder)?

> **Version:** *2022-09-20*

Individuals with intellectual and/or developmental disabilities (I/DD) are particularly susceptible to COVID-19, demonstrating more severe illness, greater risk of hospitalization, and almost twice the case fatality rates for individuals aged 18–74[3].

Current COVID-19 vaccines continue to exhibit strong protection against severe disease and death across all virus variants seen to date. Therefore, reaching high coverage with the primary vaccination series and additional doses among all eligible people, especially the most vulnerable including those with I/DD, remains a priority.

6.29 Is COVID-19 vaccination safe and recommended for people who have a heart condition?

> **Version:** *2022-09-20*

Vaccines are safe, effective and should be provided to people with chronic heart disease (CHD), independent of the cause and the severity of the cardiologic disease. This includes people with coronary heart disease, cerebrovascular disease, peripheral arterial disease, rheumatic heart disease, congenital heart disease, deep vein thrombosis and pulmonary embolism, and heart transplant recipients.

People with CHD have a greater risk of being hospitalized, requiring intensive care, intubation and/or ventilation and of dying from COVID-19. Because of this increased morbidity and mortality, it is important that these individuals, their household contacts and healthcare providers receive COVID-19 vaccination. There is no evidence to suggest that COVID-19 vaccines have any negative impact on a person who has CHD.

Current COVID-19 vaccines continue to exhibit strong protection against severe disease and death across all virus variants seen to date. Therefore, reaching high coverage with the primary vaccination series and additional doses among all eligible people, especially the most vulnerable, remains a priority.

Medically stable patients with CHD should be considered for COVID-19 vaccination without interruption of their treatment.

Patients with CHD will benefit from extended protection against both COVID-19 and influenza disease by co-administration of COVID-19 vaccines and seasonal influenza vaccines, whenever feasible.

Individuals who have had COVID-19 still benefit from vaccination against the disease because a combination of naturally acquired and vaccine-induced immunity is likely to offer greater protection against re-infection.

6.30 Is COVID-19 vaccination safe and recommended for people who have chronic disease and are immunocompromised (have a weakened immune system)?

> **Version:** *2022-09-20*

Some people with chronic cardiovascular disease may have an impaired immune system or may receive immunosuppression treatment. Immunocompromised people are at increased risk of severe COVID-19 illness and death.

[3] Source: Prioritizing COVID-19 vaccinations for individuals with intellectual and developmental disabilities - eClinicalMedicine https://www.thelancet.com/journals/eclinm/article/PIIS2589-5370(21)00029-8/fulltext

All WHO Emergency Use Listed vaccines provide significant protection from severe COVID-19 disease and are safe for people who are immunocompromised.

The immune response to COVID-19 vaccination and the gained protection in immunocompromised people may not be as strong as compared with the rest of the population. Therefore, immunocompromised individuals and their close contacts should receive an extended (3-dose) primary vaccination series followed by a first and second booster dose administered at an interval of 3–6 months.

6.31 Should a person who is a candidate for, or who has had, a heart transplant be vaccinated against COVID-19?

> **Version:** *2022-09-20*

People who need or have had a heart transplant are more likely to get very sick if they get COVID-19. Heart transplant candidates should receive COVID-19 vaccination prior to transplantation whenever possible to help ensure an adequate immune response.

Those who have had a heart transplant and are on anti-rejection drugs can and also should get vaccinated against COVID-19.

It is not recommended to withhold immunosuppression prior to or after COVID-19 vaccine administration.

8 Regulatory approvals

8.1 What does emergency use authorization mean?

> **Version:** *2021-06-29*

> **Tags:** *regulatory agencies, emergency use authorization, EUA, WHO prequalification*

WHO's Emergency Use Listing (EUL) is a procedure for assessing and listing vaccines with the ultimate aim of making them more readily available to people affected by a public health emergency. It opens the door for countries that do not have robust regulatory systems of their own and need to rely on WHO's robust review process to expedite their own regulatory approval processes to import and administer the vaccine. It also enables UNICEF and the Pan-American Health Organization to procure the vaccine for distribution to countries in need.

WHO has already listed several COVID-19 vaccines for emergency use. WHO and partners are working night and day to evaluate other vaccines that have reached safety and efficacy standards. We encourage even more developers to come forward for review and assessment. It's vitally important that we secure the critical supply needed to serve all countries around the world and stem the pandemic.

WHO Emergency Use Listing:

- aims to expedite access to safe and quality assured vaccines
- enables UN procurement and supports Member States decisions
- involves stringent assessment of clinical trial, manufacturing and regulatory data

8.3 Some COVID-19 vaccines in use have not been approved by WHO. Are they safe and effective?

> **Version:** *2021-06-29*

> **Tags:** *regulatory agencies, WHO, emergency use authorization*

WHO has approved several COVID-19 vaccines for Emergency Use Listing so far. Other vaccines that have not yet been approved by WHO may be under evaluation or may have not been submitted for this specific assessment. Not having completed evaluation and approval by WHO does not necessarily mean that a vaccine is not safe or efficacious, but it precludes its specific recommendation by WHO and its distribution through UN agencies.

WHO Emergency Use Listing enables accelerated access to COVID-19 vaccines for countries seeking to protect healthcare workers and at-risk populations. It is a prerequisite for vaccine supply through the COVAX Facility and it allows countries to expedite their own regulatory approval to import and administer COVID-19 vaccines.

- WHO grants Emergency Use Listing (EUL) to vaccines that it has thoroughly evaluated for safety and efficacy.
- Nationally approved vaccines that do not (yet) have WHO EUL may also be safe and efficacious but WHO has not been able to assess this yet.

9 Comirnaty® – Pfizer-BioNTech vaccine

9.3 What adverse reactions are associated with the Pfizer-BioNTech mRNA vaccine?

> **Version:** *2023-03-17*

The most common adverse effects are pain at the site of injection (> 80%), fatigue (> 60%), headache (> 50%), myalgias (muscle pain) and chills (> 30%), arthralgias (joint pain) (> 20%), fever and inflammation at the injection site (> 10%), mostly mild or moderate in intensity and disappearing within a few days after vaccination. These reactions are more common after the second dose and their frequency decreases with age.

In addition, very rare cases of myocarditis and pericarditis (inflammation of the heart muscle or membrane around the heart) have been observed. These cases have occurred mainly in the 14 days following vaccination, with greater frequency after the second dose of vaccination, and more commonly in younger men. Myocarditis and pericarditis are mild in most cases and resolve with treatment and rest.

Cases of anaphylaxis have been reported. However, anaphylaxis to the mRNA COVID-19 vaccines is currently estimated to occur in 2.5 to 11.1 cases per 1 million doses, largely in individuals with a history of allergy. Anaphylaxis is treatable if recognized early and treated promptly.

If a person had a severe allergic reaction after getting a shot of an mRNA COVID-19 vaccine (either Pfizer-BioNTech or Moderna), that person should not get another shot of that vaccine.

Update (March 2023):

Overall, the safety profile associated with a third dose of BNT162b2 (30 µg) administered approximately 6 months after completing the two-dose regimen is very similar to the safety profile of the initial regimen itself, with no new safety concerns identified in the those who received a booster and with no increased reactogenicity or unusual adverse events or other safety findings.

10 mRNA-1273 – Moderna vaccine

10.3 What adverse reactions are associated with Moderna's mRNA-1273 vaccine?

> **Version:** *2023-03-17*

The most common side effects are pain at the injection site (92%), fatigue (70%), headache (64.7%), myalgias (muscle pain) (61.5%), arthralgias (joint stiffness) (46.4%), chills (45.4%), nausea/vomiting (23%), fever (15.5%) and swelling at the injection site (14.7%). These reactions are mostly mild or moderate and transient, disappearing a few days after vaccination. These reactions are more common after the second dose and their frequency decreases with age.

In addition, very rare cases of myocarditis and pericarditis (inflammation of the heart muscle or membrane around the heart) have been observed. These cases occurred mainly in the 14 days following vaccination, with greater frequency after the second dose of vaccination, and more commonly in younger men. Myocarditis and pericarditis are mild in most cases and resolve with treatment and rest.

Delayed skin reactions near the injection site have also been described, which occur about 7 days (between 2 and 12 days) after receiving the vaccine and have been described as oedematous, pruritic, and painful plaques. This reaction may appear earlier after administration of the second dose. They usually resolve in about 5 days, but in some cases they can persist up to 21 days. However, this reaction after the first dose is not a contraindication for the administration of the second dose.

Cases of anaphylaxis to the mRNA COVID-19 vaccines are very rare - currently estimated to occur in 2.5 to 11.1 cases per 1 million doses, largely in individuals with a history of allergy. Anaphylaxis is treatable if recognized early and treated promptly. If a person has a severe allergic reaction after getting a shot of an mRNA COVID-19 vaccine (either Pfizer-BioNTech or Moderna), that person should not get another shot of that vaccine.

Update (March 2023):

The reactogenicity and adverse event profile observed after the booster dose was generally similar to that observed following dose 2 of the initial 2-dose regimen, which suggests no potentiation of reactogenicity or any new safety signals arising from administration of a third dose.

11 Vaxzevria – Oxford-AstraZeneca vaccine

11.1 How does Vaxzevria, the Oxford-AstraZeneca COVID-19 vaccine work?

> **Version:** *2021-04-14*

> **Tags:** *COVID-19 vaccines, vector vaccines, Oxford-AstraZeneca, ChAdOx1*

The Oxford-AstraZeneca vaccine is made from a virus (ChAdOx1), which is a weakened version of a common cold virus (adenovirus) that causes infections in chimpanzees. The adenovirus has been genetically changed so that it is impossible for it to cause infection in humans.

Genetic material has been added to this weakened adenovirus, allowing it to make spike proteins from the COVID-19 coronavirus (SARS-CoV-2). These proteins are found on the surface of SARS-CoV-2, the virus that causes COVID-19. They play an essential role in the infection pathway of the SARS-CoV-2 virus.

Vaccinating with this weakened adenovirus, trains the body to recognize SARS-CoV-2 virus and develop an immune response to its spike protein that helps to prevent disease if SARS-CoV-2 virus later enters the body.

COVID-19 vector vaccines:

- are made from a weakened, harmless virus that mimics the COVID-19 virus
- train the body to recognize the spike protein of SARS-CoV-2 virus
- prevent COVID-19 disease

11.4 Is Vaxzevria, the Oxford-AstraZeneca vaccine, safe?

> **Version:** *2023-03-17*

The AstraZeneca vaccine is safe and effective at protecting people from the extremely serious risks of COVID-19, including death, hospitalization and severe disease.

Common, mild symptoms following vaccination include tenderness, pain, warmth, redness, itching, swelling or bruising where the injection is given, tiredness, headache, fever, nausea or muscle ache.

A very rare syndrome of blood clotting combined with low platelet counts, described as thrombosis with thrombocytopenia syndrome (TTS), has been reported around 3 to 30 days following vaccination with the ChAdOx1-S [recombinant] vaccine. Data from the United Kingdom (as of 14 June 2021) and the European Union suggest the risk of TTS is estimated to be approximately 1 case per 100 000 vaccinated adults.

Rare cases of Guillain-Barré Syndrome (GBS) have also been reported following vaccination with this vaccine.

WHO has reviewed all evidence on these rare events and concluded that the benefits of these vaccines in preventing severe illness and deaths far outweigh the small risks. In addition, WHO and countries are conducting research and implementing actions to mitigate further those small risks.

Health care personnel should be alert to the signs and symptoms of thromboembolism and/or thrombocytopenia. Those vaccinated should be instructed to seek immediate medical attention if they develop symptoms such as shortness of breath, chest pain, leg swelling, persistent abdominal pain following vaccination. Additionally, anyone with neurological symptoms including severe or persistent headaches and blurred vision after vaccination, or who experience skin bruising (petechia) beyond the site of vaccination after a few days, should seek prompt medical attention.

It is important to remember that serious adverse reactions are very rare and treatable when diagnosed early and that the risks are higher with COVID-19 disease than following vaccination.

Update (March 2023):

A possible risk of rare cases of GBS following vaccination with Oxford-AstraZeneca vaccine has been observed. GBS can also occur following COVID-19 and other viral infections. GBS is rare and is treatable if diagnosed early. Very rare reports of capillary leak syndrome (CLS) have also been reported following vaccination with Oxford-AstraZeneca vaccine, with an estimated reporting rate of 1 case per 5 million doses.

Strategic Advisory Group of Experts on Immunization (SAGE) interim recommendations for use of COVID-19 vaccines: https://www.who.int/groups/strategic-advisory-group-of-experts-on-immunization/covid-19-materials

11.6 Were there any underlying conditions or risk factors in the individuals who suffered from Thrombosis with Thrombocytopenia Syndrome (TTS) after AstraZeneca (Vaxzevria) vaccination?

> **Version:** *2023-03-17*

No underlying conditions in the individuals who suffered from Thrombosis with Thrombocytopenia Syndrome (TTS) after AstraZeneca vaccination were found, and no underlying conditions contraindicate or pose a special precaution to AstraZeneca vaccination to date. Rare clotting problems like cerebral venous thrombosis are more common among pregnant or postpartum women. Other risk factors for such events include recently starting oral contraceptives, sepsis, cancer, and having an underlying condition that increases the tendency to form clots such as Factor V Leiden deficiency or lupus. However, none of these conditions is associated with thrombocytopenia; these conditions have not been identified as a risk factor for TTS, therefore none of them represents a contraindication for vaccination against COVID-19.

Update (March 2023): Rare cases of TTS following vaccination are a contraindication for subsequent vaccination with the same vaccine.

11.7 What are the early signals of potential blood clotting events following immunization that people should be aware of?

> **Version:** *2023-03-17*

As of April 2021, more than 25 million doses of the AstraZeneca vaccine have been administered in Europe and more than 27 million doses of the Covishield vaccine (AstraZeneca vaccine licensed by Serum Institute of India)

have been administered in India. In very rare cases, unusual blood clots associated with thrombocytopenia have been reported within 4-20 days of getting the vaccine.

It is important to be aware of the following symptoms if they should occur following vaccination: shortness of breath, chest pain, leg swelling or persistent abdominal pain. Additionally, anyone with neurological symptoms including severe or persistent headaches or blurred vision after vaccination, or who experiences skin bruising (petechia) beyond the site of vaccination after a few days, should seek prompt medical attention.

11.8 I have received the AstraZeneca vaccine and I have a headache, should I urgently consult my doctor?

> **Version:** *2021-04-14*

Headache is one of the most frequent symptoms that can appear after the administration of any vaccine, not only COVID-19 vaccines. Tiredness, myalgia and shivering are also common. In general, these symptoms subside in the first 24-48 hours after vaccination with or without specific treatment, so immediate consultation with a physician is not necessary.

If the headache is intense, it persists for more than 3 days, increases with movement or when lying down and does not subside with usual analgesics, or if it is accompanied by vascular lesions on the skin (petechiae, hematomas), it should be a reason for urgent consultation at the nearest health center.

11.11 What is Vaccine-Induced Thrombosis with Thrombocytopenia Syndrome (TTS)?

> **Version:** *2021-04-14*

The United Kingdom, European Union, and Scandinavian countries have reported rare cases of cerebral sinus vein thrombosis (CSVT) and thrombocytopenia in patients who received the AstraZeneca COVID-19 vaccine in the previous 4 to 20 days[4]. It is rare, occurring in anywhere from 1 in every 125,000 to 1 in 1 million people[5] [6]; and most of the cases have occurred in women under age 60, although these countries used most of their initial AstraZeneca vaccine supply in this particular age group and may therefore be overrepresented.

The biological mechanism for this syndrome of TTS is still being investigated. At this stage, a 'platform specific' mechanism related to the adenovirus-vectored vaccines is not certain but cannot be excluded.

One plausible explanation for the combination of blood clots and low blood platelets is an immune response, leading to a condition similar to one seen sometimes in patients treated with heparin (heparin induced thrombocytopenia). However, since TTS is immune-mediated, an individual with a thrombophilia, a family

[4] Pai M, Grill A, Ivers N, et al. Vaccine induced prothrombotic immune thrombocytopenia VIPIT following AstraZeneca COVID-19 vaccination. Science Briefs of the Ontario COVID-19 Science Advisory Table. 2021;1(17). DOI: https://doi.org/10.47326/ocsat.2021.02.17.1.0

[5] PINHO AC. COVID-19 Vaccine AstraZeneca: benefits still outweigh the risks despite possible link to rare blood clots with low platelets. European Medicines Agency. Published March 18, 2021. Accessed March 31, 2021. https://www.ema.europa.eu/en/news/covid-19-vaccine-astrazeneca-benefits-still-outweigh-risks-despite-possible-link-rare-blood-clots

[6] Updated GTH statement on vaccination with the AstraZeneca COVID-19 vaccine, as of March 22, 2021. Published March 18, 2021. Accessed March 31, 2021. https://gth-online.org/wp-content/uploads/2021/03/GTH_Stellungnahme_AstraZeneca_3_24_2021.pdf

history of blood clots, or a personal history of arterial or venous clots would likely not be at increased risk of TTS. Accordingly, there are no new contraindications to receiving the AstraZeneca vaccine.

In case TTS is suspected, the recommended treatment might be similar to that of HIT, this is, intravenous gammaglobulin and non-heparin derived anticoagulants.

12 Janssen COVID-19 Vaccine (Johnson & Johnson)

12.1 How does the Janssen COVID-19 vaccine work?

> **Version:** *2023-03-17*

COVID-19 Vaccine Janssen is a vector vaccine made up of another virus (an adenovirus type 26) that has been modified to contain the gene for making the SARS-CoV-2 spike protein (glycoprotein (Ad26.COV2-S). This is a protein on the SARS-CoV-2 virus which it uses to enter the body's cells.

Adenovirus type 26 is a nonreplicative human adenovirus. The virus in the vaccine does not cause disease. Vaccinating with this weakened adenovirus trains the body to recognize SARS-CoV-2 virus and develop an immune response against its spike protein that helps to prevent disease if SARS-CoV-2 virus later enters the body.

The adenovirus passes the SARS-CoV-2 gene into the vaccinated person's cells. The cells can then use the gene to produce the spike protein. The person's immune system will recognise the spike protein as foreign and produce antibodies and activate T cells to target it. Later, if the person comes into contact with SARS-CoV-2 virus, the person's immune system will recognise the spike protein on the virus and be ready to defend the body against it.

Janssen COVID-19 vaccine:

- contains a weakened adenovirus that carries the gene to produce the SARS-CoV-2 spike protein
- trains the vaccinated person's body to fight off the SARS-CoV-2 virus

Strategic Advisory Group of Experts on Immunization (SAGE) interim recommendations for use of COVID-19 vaccines: https://www.who.int/groups/strategic-advisory-group-of-experts-on-immunization/covid-19-materials

12.2 How many doses of Janssen COVID-19 vaccine do I need to be protected?

> **Version:** *2021-12-17*

Countries can choose to use the Janssen (Ad26.COV2.S) vaccine as a schedule with a single or two doses. A single dose is sometimes preferred in countries to reach rapid widespread coverage and to protect hard-to-reach populations, but administration of the second dose will result in increased individual-level protection against symptomatic infection and against severe disease. WHO recommends an inter-dose interval of 2 to 6 months. The choice for the inter-dose interval depends on the epidemiological situation and needs for certain subpopulations.

12.4 What are the most frequent and rare adverse reactions associated with the use of Janssen COVID-19 vaccine?

> **Version:** *2021-12-17*

As of 31 August 2021, an estimated 33.5 million doses of Janssen (Ad26.COV2.S) vaccine had been administered. The most common side effects with COVID-19 vaccine Janssen are pain at the injection site, headache, tiredness, muscle pain and nausea. They are mild or moderate and resolve within 1 or 2 days after vaccination.

Based on post-marketing safety surveillance, the following rare safety concerns have been identified: thrombosis with thrombocytopenia syndrome (TTS) in approximately 2 cases per million doses administered, Guillain-Barre Syndrome (GBS) in 7–8 cases per million doses administered, and capillary leak syndrome (CLS) in 0.21 cases per million doses administered, some in persons with a prior history of CLS.

In countries with ongoing SARS-CoV-2 transmission, the benefit of vaccination in protecting against COVID-19 far outweighs the risks of any rare adverse reactions. The benefit–risk ratio is greatest in older age groups as the risk of severe COVID-19 disease outcomes, including COVID-19 related thromboembolic events, increases with age.

It is important to remember that serious adverse reactions are very rare and treatable when diagnosed early, and that the risks are higher with COVID-19 disease than following vaccination.

13 Nuvaxovid / Covovax – Novavax vaccine

13.1 Is Novavax vaccine safe and effective?

> **Version:** *2023-03-17*

The NVX-CoV2373 (Novavax) vaccine against COVID-19 is protein-based and consists of a recombinant SARS-CoV-2 spike protein nanoparticle administered as a co-formulation with the adjuvant MartrixTM The vaccine received WHO Emergency Use Listing (EUL) in December 2021. The WHO EUL process evaluates the quality of manufacturing along with safety and efficacy of the vaccine. Like all other EUL vaccines, Novavax COVID-19 vaccine is safe and highly effective in preventing severe disease and hospitalization due to COVID-19. This vaccine is recommended for people aged 12 and above.

In Europe, the vaccine is manufactured under the tradename Nuvaxovid; in India, the vaccine is manufactured by the Serum Institute of India under the trade name Covovax.

Strategic Advisory Group of Experts on Immunization (SAGE) interim recommendations for use of COVID-19 vaccines: https://www.who.int/groups/strategic-advisory-group-of-experts-on-immunization/covid-19-materials

14 Covaxin vaccine

14.1 Is Covaxin vaccine safe and effective?

> **Version:** *2023-03-17*

The BBV152 (Covaxin) vaccine against COVID-19 manufactured by Bharat Biotech is a whole virion inactivated SARS-CoV-2 vaccine that received WHO Emergency Use Listing (EUL) in December 2021 (with an update published on 15 March 2022).

The WHO EUL process evaluates the quality of manufacturing along with safety and efficacy of the vaccine. Like all other EUL vaccines, Covaxin COVID-19 vaccine is safe and highly effective in preventing severe disease and hospitalization due to COVID-19.

This vaccine is recommended for people aged 18 years and older.

The supply of Covaxin (Bharat Biotech) through UN procurement agencies remains suspended (as of January 2023) in response to the outcome of a WHO inspection on 14–22 March 2022, and due to the need to conduct process and facility upgrade to address identified deficiencies in good manufacturing practices (GMP).

The risk assessment at that time did not indicate changes in the risk–benefit ratio. The data, available to WHO, indicate the vaccine is effective and no safety concerns exist.

Strategic Advisory Group of Experts on Immunization (SAGE) interim recommendations for use of COVID-19 vaccines: https://www.who.int/groups/strategic-advisory-group-of-experts-on-immunization/covid-19-materials

15 CanSino vaccine Ad5-nCoV-S (Convidecia)

15.1 Is CanSino vaccine Ad5-nCoV-S (Convidecia) safe and effective?

> **Version:** *2023-03-17*

Ad5-nCOV-S vaccine against COVID-19 manufactured by CanSino Biologicals is a non-replicative adenovirus vector-based vaccine that received WHO Emergency Use Listing (EUL) in May 2022. The WHO EUL process evaluates the quality of manufacturing along with safety and efficacy of the vaccine. All of the vaccines that have achieved WHO Emergency Use Listing can be considered safe and highly effective in preventing severe disease and hospitalization due to COVID-19.

As of 31 December 2021, about 58 million doses of Ad5-nCoV-S had been distributed worldwide. This vaccine is recommended for people aged 18 years and above.

Strategic Advisory Group of Experts on Immunization (SAGE) interim recommendations for use of COVID-19 vaccines: https://www.who.int/groups/strategic-advisory-group-of-experts-on-immunization/covid-19-materials

16 COVID-19 vaccination and the Ukraine crisis

16.1 If a person has documented evidence of COVID-19 vaccination received outside of Ukraine, should he/she start the series again upon return to Ukraine, or receive the next scheduled dose?

> **Version:** *2022-06-27*

Information on doses of COVID-19 vaccine administered outside of Ukraine (if the vaccine is also registered in Ukraine) should be added to the person's profile in the electronic health care system upon returning to Ukraine. According to national health authorities in Ukraine, these individuals can then receive further vaccinations in accordance with the national schedule and guidelines.

WHO recommends that individuals eligible for vaccination who have received one COVID-19 vaccine dose should receive the second dose and a booster dose (of the same or another COVID-19 vaccine). Eligible individuals with two documented doses of COVID-19 vaccines should receive a booster dose.

16.2 If a person received a vaccine abroad that is not registered in Ukraine – is the vaccination recognized in Ukraine?

> **Version:** *2022-06-27*

All vaccines authorized by WHO through Emergency Use Listing (EUL) are safe and effective against severe COVID-19 infection. WHO welcomes national decisions to recognize all doses administered with any EUL-listed vaccine.

The recognition of vaccines, and potentially also their registration in national databases, may differ per country. In Ukraine, only nationally registered vaccines can currently be recorded in the national electronic system.

Nevertheless, it is important to retain proof of vaccination with any EUL vaccine for the purpose of documenting vaccination status and to help inform further vaccination decisions together with a person's health care provider and as recommended by the national health authorities.

16.4 Is it helpful to take vaccination records with you when leaving Ukraine to reside in a host country?

> **Version:** *2023-03-17*

Anyone intending to leave Ukraine who has access to documents confirming their (and/or their children's) vaccination status (against COVID-19 and/or other diseases) is advised to bring them. This documentation will make it much easier to confirm vaccination status and inform further vaccination decisions in the host country as needed.

16.5 Can a person receive routine vaccination for adults (e.g., Tdap vaccine against tetanus/diphtheria/pertussis) and COVID-19 vaccination during the same visit?

> **Version:** *2022-06-27*

According to WHO guidelines based on several co-administration studies of COVID-19 vaccines and inferred from co-administration studies of other adult vaccines, COVID-19 vaccines may be given concomitantly (during the same visit), or any time before or after, other adult vaccines including live attenuated, inactivated, adjuvanted, or non-adjuvanted vaccines.

When administered concomitantly, the vaccines should be injected using individual syringes, in separate sites, preferably different extremities.

For children and adolescents, evidence from co-administration studies is currently insufficient. Nevertheless, the same principle as with adults can be applied. Each opportunity or visit to a health care provider should be used to administer missing vaccines to get maximum protection.

16.7 How can a person vaccinated in Ukraine obtain proof of COVID-19 vaccinations if he/she now resides outside of the country?

> **Version:** *2022-06-27*

Vaccinations administered In Ukraine are recorded in the national electronic healthcare system. Through this system a person receiving a vaccine can be issued an international standard paper vaccination certificate as well as an electronic certificate with a QR-code via the Diia phone application[7].

Any refugee from Ukraine, or internally displaced person within Ukraine, may request and remotely obtain proof of vaccination status for themselves or their children. The steps are as follows:

- The person requests a vaccination certificate from the health care provider in Ukraine with whom they are registered. The requester should indicate the form in which they would like to receive the certificate (paper or digital) and the preferred means of communication (e.g., e-mail).
- The health care provider in Ukraine will access the requestor's vaccination information (or that of their child) via the electronic health care system (EHCS). A digital copy of the certificate can be signed electronically by the provider via this link: https://diia.gov.ua/services/pidpisannya-dokumentiv. A paper copy of the certificate would be both signed and stamped by the provider.
- The health care provider will then send the digital or paper copy of the certificate to the requester.

See for more information the WHO document:

Obtaining proof of vaccination status and assessing vaccination records of refugees from Ukraine. Supplement to: Guidance on vaccination and prevention of vaccine-preventable disease outbreaks for countries hosting refugees from Ukraine, April 2022 update. https://apps.who.int/iris/handle/10665/353409

[7] https://diia.gov.ua/services/covid19-sertifikat-pro-vakcinaciyu

16.8 If a person from Ukraine is residing in a country where recommended intervals between COVID-19 vaccinations differ from those in Ukraine, which schedule and intervals should be followed?

> **Version:** *2022-06-27*

The vaccination schedule, including intervals between successive doses, recommended by the host country should be applied.

16.9 If a person from Ukraine is residing temporarily outside of the country, should they receive their first or next scheduled dose of a COVID-19 vaccine in the host country or wait until they return to Ukraine?

> **Version:** *2022-06-27*

People from Ukraine residing outside of the country are advised to contact health authorities or visit a COVID-19 vaccination center in the host country to assess their COVID-19 vaccination status and receive any outstanding doses. They should start or continue receiving COVID-19 (and any other) vaccinations according to the national guidelines of the host country.

WHO recommends that eligible individuals who have received one documented COVID-19 vaccine dose should receive the second dose and a booster dose. Eligible individuals with two documented doses of COVID-19 vaccines should receive a booster dose. For best protection a person should receive all recommended doses, regardless of whether they have previously had COVID-19 disease.

16.10 Are COVID-19 vaccinations administered in Ukraine recognized in other countries?

> **Version:** *2022-06-27*

Each country makes its own decisions regarding recognition of specific COVID-19 vaccines. In general, most counties recognize vaccines authorized for use by national drugs regulatory authorities and those that are in the WHO Emergency Use List.

All vaccines registered in Ukraine are Emergency Use Listed by WHO. It is important to check the host country's policy on recognizing COVID-19 vaccines and the country's guidance for those wishing to receive a vaccine.

It is always important to maintain a record of any received COVID-19 vaccine, as this may be needed to facilitate travel and entrance to facilities, depending on the specific regulations in the host country. This documentation can also be used to decide on the subsequent vaccine doses needed to provide maximum protection against COVID-19 upon return to Ukraine.

16.11 If an adult or child from Ukraine receives a vaccination while residing in another country, should proof of the vaccination be shared with his or her healthcare provider after returning to Ukraine?

> **Version:** *2022-06-27*

Documentation of received vaccine doses (either on paper or digital) may vary per country but in general it contains:

- last and first names of the vaccinated individual;
- vaccine product name and lot number;
- date of vaccine administration;
- name of the responsible healthcare professional and healthcare facility.

Upon return to Ukraine, this documentation should be shared with the family doctor or paediatrician so that the information can be used to inform further vaccination decisions and ensure maximum protection. This also makes it possible to transfer the information to the national medical information system/database in Ukraine for further monitoring and decision making.

17 Sinovac (CoronaVac) COVID-19 vaccine

17.1 Is the Sinovac COVID-19 vaccine safe and effective?

> **Version:** *2023-03-17*

Sinovac-CoronaVac is an aluminium-hydroxide-adjuvanted, inactivated whole virus vaccine, which was granted WHO Emergency Use Listing (EUL) in May 2021. The WHO EUL process evaluates the quality of manufacturing along with all available safety and efficacy data. All of the vaccines that have achieved WHO EUL can be considered safe and highly effective in preventing severe disease and hospitalization due to COVID-19. Since receiving the WHO EUL, this vaccine has been administered to millions of people around the world, and data from the field have been assessed in WHO updates of its interim guidance published in October 2021 and March 2022.

For example, a study in Chile involving 10.2 million persons aged 16 years and older who had received 2 doses found the vaccine to be 66% effective for the prevention of COVID-19; 88% for the prevention of hospitalization; 90% for the prevention of intensive care unit (ICU) admission; 86% for the prevention of COVID-19-related death. These data were generated when gamma and alpha COVID-19 variants were circulating[8].

Sinovac-CoronaVac is intended for persons aged 18 years and older. The recommended primary vaccine series is 2 doses (0.5 ml) given intramuscularly into the deltoid muscle. A booster dose is recommended for the highest and high priority-use groups (e.g. older adults, health workers, persons with comorbidities), administered 4–6 months after the completion of the primary series.

Strategic Advisory Group of Experts on Immunization (SAGE) interim recommendations for use of COVID-19 vaccines: https://www.who.int/groups/strategic-advisory-group-of-experts-on-immunization/covid-19-materials

[8] Jara A, Undurraga EA, Gonzalez C, Paredes F, Fontecilla T, Jara G et al. Effectiveness of an Inactivated SARS-CoV-2 Vaccine in Chile. N Engl J Med. 2021;385:875-84. DOI: https://doi.org/10.1056/NEJMoa2107715.

18 Sinopharm BIBP COVID-19 vaccine

18.1 Is the Sinopharm BIBP (Covilo) COVID-19 vaccine safe and effective?

> **Version:** *2023-03-17*

The COVID-19 vaccine BIBP, is an aluminium-hydroxide-adjuvanted, inactivated whole virus vaccine, which was granted WHO Emergency Use Listing (EUL) in May 2021. The WHO EUL process evaluates the quality of manufacturing along with all available safety and efficacy data. All of the vaccines that have achieved WHO EUL can be considered safe and highly effective in preventing severe disease and hospitalization due to COVID-19. Since receiving the WHO EUL, this vaccine has been administered to millions of people around the world, and data from the field have been assessed in WHO updates of its interim guidance published in October 2021 and March 2022.

For example, in Hungary, vaccine effectiveness in a large nationwide cohort (approx. 900 000 recepients of BIBP COVID-19 vaccine) was 69% against SARS-CoV-2 infection; and 88% (95% CI: 86–89%) against COVID-19-related mortality[9].

Sinopharm BIBP is intended for persons aged 18 years and older. The recommended primary vaccine series is 2 doses (0.5 ml) given intramuscularly into the deltoid muscle. A booster dose is recommended for the highest and high priority-use groups (i.e. older adults, health workers, persons with comorbidities), administered 4–6 months after completion of the primary series.

Strategic Advisory Group of Experts on Immunization (SAGE) interim recommendations for use of COVID-19 vaccines: https://www.who.int/groups/strategic-advisory-group-of-experts-on-immunization/covid-19-materials

[9]Vokó Z, Kiss Z, Surján G, Surján O, Barcza Z, Pályi B et al. Nationwide effectiveness of five SARS-CoV-2 vaccines in Hungary—the HUN-VE study. Clinical Microbiology and Infection. DOI: https://doi.org/10.1016/j.cmi.2021.11.011

19 Valneva (VLA2001) vaccine

19.1 Is the Valneva COVID-19 vaccine (VLA2001) safe and effective?

> **Version:** *2023-03-17*

Valneva vaccine (VLA2001), developed by Valneva in France and Austria, is a purified, inactivated, and adjuvanted whole virus SARS-CoV-2 vaccine. Inactivated vaccines cannot replicate, so vaccinees cannot become infected with the virus.

VLA2001 received WHO Emergency Use Listing (EUL) on 18 August 2022. The WHO EUL process evaluates the quality of manufacturing along with all available safety and efficacy (or immunogenicity) data of the vaccine. All of the vaccines that have achieved WHO Emergency Use Listing can be considered safe and highly effective in preventing severe disease and hospitalization due to COVID-19.

VLA2001 is recommended in persons aged 18 and above.

Strategic Advisory Group of Experts on Immunization (SAGE) interim recommendations for use of COVID-19 vaccines: https://www.who.int/groups/strategic-advisory-group-of-experts-on-immunization/covid-19-materials