The COVID-19 vaccination programme

The approval of COVID-19 vaccines in December 2020 signifies a major milestone in the battle against the coronavirus SARS-CoV-2. The arrival of these vaccines will be met with hope, but also anxiety. Many will be thinking of whether to have the vaccine or not.

This article presents a summary of the current scientific information and guidance available on the SARS-CoV-2 vaccine. You can find a more detailed version of this article on the NASS website within our news item on COVID-19. This includes all the article references.

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What are vaccines?

Vaccines are material that contain weakened or inactive parts of a particular organism such as virus or bacteria and it triggers an immune response within the body.

It is with this same principle that vaccines will be one of the important ways to control the COVID-19 pandemic.

Why vaccinate?

When a person is vaccinated, they are very likely to be protected against the bacteria or virus by production of antibodies or activation of immune cells. However, there is no vaccine that provides 100% protection.

In addition, not everyone can be vaccinated. There are certain conditions where a vaccine is not suitable for a person. For example, people who have severe allergies to some vaccine components may not be able to receive certain vaccines.

These people may still be protected if they live amongst others who are vaccinated. When a significant number of people in the population are vaccinated, it becomes more difficult for the infection to be passed around. This is known as herd immunity and those who are unable to be vaccinated will receive substantial (but not full) protection against the infection.

So vaccination provides protection both for the person receiving it and also for those in the population are unable to be vaccinated. This is why if you are eligible and able to, you should receive the vaccine.

Can I get COVID-19 from the vaccine?

You cannot get COVID-19 from the vaccine.

All vaccines that are presently under development specifically for COVID-19 are non-live vaccines that cannot give you the disease.

Which COVID-19 vaccines are available?

The genetic sequence of SARS-CoV-2 was published on 11 January 2020, and was followed by the rapid research and development of vaccines. At the end of 2020, there were over 60 COVID-19 vaccines in human clinical trials.

It is important to have a range of different vaccines available as manufacturing has to be scaled up to meet the race against time to supply vaccines for the global population.

The vaccines have been given rapid approval with government funding and early review of the data. People who are hesitant to get a COVID-19 vaccine should be reassured that the approval process has been independent and robust.

There are currently three types of COVID-19 vaccines that have completed or are soon to start Phase 3 clinical trials.

MRNA VACCINES

These vaccines contain genetic code for the virus that gives instruction to our cells to make proteins that resemble part of the virus, in this case the S (spike) protein of the SARS-CoV-2. It is not made up of any part of the COVID-19 pathogen (live or dead).

The genetic code is called messenger ribonucleic acid (mRNA) and uses this new technology that is different from other vaccines we had before. The mRNA is not integrated into the host DNA. The genetic code from the vaccine is destroyed when the proteins are made.

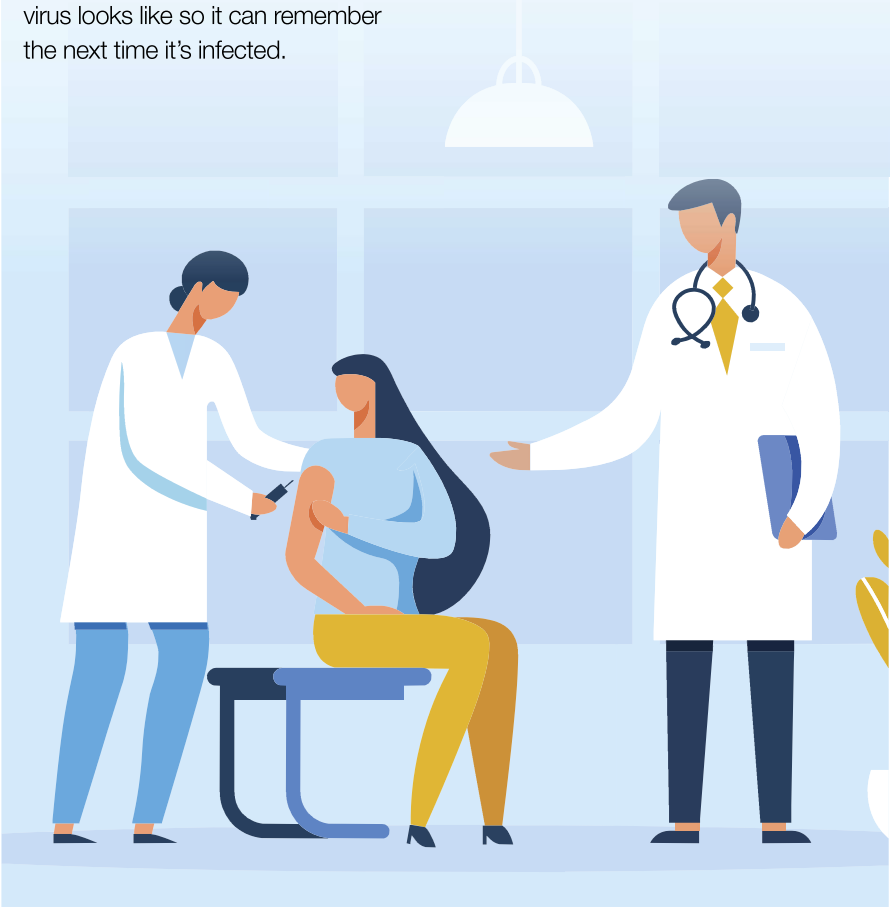
The harmless protein produced is recognised by immune cells (B and T cells) and protection is developed against future infection from COVID-19. The vaccine shows the body's immune system what the virus looks like so it can remember the next time it's infected.

VIRAL VECTORS

These vaccines contain the genetic material of SARS-CoV-2 and are inserted into a weakened version of a non-related virus. This is called a viral vector. When the viral vector is inside our cells, the genetic material instructs cells to make proteins that stimulate an immune response from B and T cells that will remember how to react against the virus if we get infected in the future.

PROTEIN SUBUNITS

These vaccines contain proteins from the virus that cause COVID-19. These harmless proteins cannot cause the infection and are given as a vaccine. Once inside cells, the immune cells recognise the proteins and begin making antibodies and T-cells. These immune cells will confer protection against future infection with COVID-19.



The list of COVID-19 vaccines are:

BNT-162B2 (PFIZER, BIONTECH)

Approved for use in the UK by the MHRA on 2nd December 2020, this vaccine is a mRNA vaccine that encodes the SARS-CoV-2 receptor-binding domain antigen.

The mRNA molecule is unstable and this is why it needs to be stored at very low temperatures, otherwise the molecule can break down. It is stored ultra-cold at -70ºC. Once thawed it can be kept refrigerated for up to 5 days. The vaccine comes in a liquid injection and is given as 2 injections, 21 days apart.

The vaccine contains natural tiny oily particles called lipid nanoparticles and these microscopic spheres contain the mRNA molecule. The small droplets are the same structure as the cell membranes, so they can fuse with the membrane allowing the mRNA to enter the cells. The lipids also stabilise the mRNA molecule. Once inside the cells, the mRNA produces the spike (S) protein. The immune system then recognises this as a foreign entity and attacks it using antibodies and T-cells. The immune system learns and remembers how to destroy the spike protein, so if the virus enters the body, it will recognise and destroy it.

MRNA-1273 (MODERNA)

Approved by MHRA for use in the UK on January 8, 2021. This is also an mRNA vaccine. It is a lipid-nanoparticle-encapsulated mRNA vaccine expressing the prefusion-stabilised spike glycoprotein. This vaccine encodes the S-2P antigen.

There are some differences compared to the Pfizer/BioNTech vaccine in the composition of the lipid spheres. There are four types of lipid nanoparticles used to hold the mRNA. The ratios of these lipids, as well as whether they are positively or negatively charged, is what differentiates the mRNA vaccines.

This also means they require different storage conditions. The vaccine is stored at -20°C. Once thawed it can be stored in the refrigerator (2-8°C) for 30 days. It is given as 2 injections, 28 days apart.

AZD-1222 (CHADOX1 NCOV-19, ASTRA-ZENECA; OXFORD UNIVERSITY)

Approved by MHRA for use in the UK on December 29, 2020. This is a viral vector vaccine. The Oxford/AstraZeneca vaccine uses a vector from a common cold virus (adenovirus) from a chimpanzee. It is harmless and has been genetically changed so cannot grow inside human cells. This replication-deficient chimpanzee adenoviral vector vaccine contains the full-length SARS-CoV2 spike protein genetic sequence.

It delivers into the host cells the surface glycoprotein antigen (spike protein) gene. The gene (DNA) is shuttled into cells and makes the cell produce proteins that will prime the immune system. It elicits antibodies to attack the SARS-CoV-2 virus if it later infects the body. It is more stable and can be stored with refrigeration. It is given as 2 injections, 28 days apart.

AD26.COV2.S (JOHNSON & JOHNSON)

This is a viral vector vaccine. It is an adenovirus serotype 26 (Ad26) recombinant vector-based vaccine. It can be stored in the refrigerator. Phase 3 trial (ENSEMBLE) ongoing. Second phase 3 trial (ENSEMBLE 2), to study effects of 2 doses.

NVX-COV2373 (NOVONAX)

This is a protein subunit vaccine. It is engineered using recombinant nanoparticle technology from SARS-CoV-2 genetic sequence to generate an antigen derived from the coronavirus spike protein. This is combined with an adjuvant (Matrix-M). It is given as 2 injections, 21 days apart. Phase 3 trial in the United Kingdom ongoing.

When will I be able to get a vaccine?

The rollout of the COVID-19 vaccine is based on age and clinical risk. The Joint Committee of Vaccination and Immunisation (JCVI) ranks priority groups according to risk, largely based on prevention of COVID-19-specific mortality.

1	Residents in a care home for older adults; staff working in care homes for older adults
2	Those 80 years of age and over; frontline health and social care workers
3	Those 75 years of age and over
4	Those 70 years of age and over, CEV individuals (not including pregnant women and those under 16 years of age)
5	Those 65 years of age and over
6	Adults aged 16-65 years who are in an at-risk group
7	Those 60 years of age and over
8	Those 55 years of age and over
9	Those 50 years of age and over

Should I receive the COVID-19 vaccine if I am on immunosuppressants?

The approved COVID-19 vaccines are recommended by the JCVI for immunosuppressed patients. This includes people on medications including anti-TNF, anti IL 17A rituximab, and individuals treated with steroid-sparing agents such as cyclophosphamide and mycophenolate mofetil. This group also includes individuals treated with systemic steroids for more than a month at a dose equivalent to prednisolone at 20mg or more per day.

People on these medications may have a diminished immune response to the vaccines. Given the level of risk seen in this group as a whole (clinically extremely vulnerable or CEV), this group should be offered the vaccine within priority group 6 or earlier.

Should I stop or pause my treatment to receive the COVID-19 vaccine?

There is currently no evidence to stop or pause your immunosuppressive treatment to receive the vaccine. However, further guidance from the JCVI will be given so this advice may be updated.

Vaccinations should preferably be given when the disease is in a quiet phase and it is also preferred to vaccinate before planned immunosuppression if feasible. For patients receiving Rituximab, where clinically possible, COVID-19 vaccines should be given four weeks or more before the treatment.

Which vaccine should I receive?

The first one you are offered.

Are there any contraindications to having the vaccine?

The vaccine should be avoided in those who have had a previous systemic allergic reaction (including immediate-onset anaphylaxis) to a previous dose of the same COVID-19 vaccine or any component (excipient) of the COVID-19 vaccine. The excipients are available for review prior to receiving the vaccine.

Do I still need the vaccine if I have had COVID-19?

Yes. Experts recommend getting vaccinated even if you have had COVID-19 in the past.

People who get COVID-19 do develop antibodies that likely provide some protection against getting infected again. But it is not known exactly how long antibodies last after a person recovers.

What if I am pregnant?

Although the available data do not indicate any safety concern or harm to pregnancy, there is insufficient evidence to recommend routine use of COVID-19 vaccines during pregnancy.

Can I breastfeed after receiving the vaccine?

Yes, you can. There is no known risk associated with giving non-live vaccines whilst breastfeeding.

Will I need a booster after the initial 2 vaccine doses?

This is not recommended at the moment as further research is needed to know if it is needed and the timing of boosters has not yet been determined.

If I get the vaccine, can I stop social distancing and wearing a mask?

Even though vaccines work very well to prevent COVID-19, it is still possible to get the infection. It will also take some time to learn exactly how long immunity lasts after a person gets a vaccine. Experts also need to learn more about how many people are getting vaccinated and how this is affecting the spread of COVID-19. Until this is known, it is recommended that social distancing, hand washing and wearing a mask continues after being vaccinated.

New medication on the horizon

A new medication called upadacitinib has been approved in the European Union as a treatment for active ankylosing spondylitis (AS) in adults.

Although upadacitib is a new type of medication for AS, it has already been approved and is being used in the UK for rheumatoid arthritis (RA). It is a selective, reversible Janus kinase (JAK) inhibitor. It works as on the immune response by targeting the enzyme JAK. The other big thing that's different about this medication is that it is taken in tablet form rather than as an injection.

The clinical trials show Rinvoq is effective in AS and has a safety profile consistent with that observed in RA.

Although it's been approved by the EMA, it will still have to be approved by the National Institute for Health and Care Excellence (NICE) and the Scottish Medicines Consortium (SMC) in the same way as other biologic medications. This is because it is a high cost medication.

NICE and the SMC will decide if it should be used within the UK for AS and what restrictions they will put on its use. For example anti TNF can only be used for people with severe active ankylosing spondylitis or severe non-radiographic axial spondyloarthritis who have tried non-steroidal anti-inflammatory drugs (NSAIDs), but they have not worked or cause side effects.

These approvals are likely to take some time but it's good to know there's potentially a new option on its way.