

The facts about Covid-19 vaccines

Understanding the
latest scientific
evidence



Vaccines against Covid-19 have been developed quickly, but with great care.

The results of trials have been analysed meticulously by scientists and doctors, as well as by increasingly well-informed journalists, commentators and the public.

Opinions are shared widely on social media, especially if new research appears to conflict with existing understanding or is headline-grabbing, and this sometimes creates confusion.

In this document we lay out the facts about vaccination to help navigate the shifting sands of misinformation and misunderstanding and help you make an informed decision about being vaccinated.

FACT

Immunity is ‘natural’, whether it has been induced by a vaccine or by being infected with Covid-19, but immunity from vaccination has many additional advantages.

There are two ways to get immunity: you get vaccinated or you get infected. Although there are differences between the immunity that you develop after a Covid-19 infection compared to vaccination, both are ‘natural’. It is your own immune system that makes the antibodies and T cells, regardless of whether this is prompted by an infection or vaccination. The immunity that you make is your own, not artificial or synthetic¹.

Vaccines prompt your immune system to respond in a more controlled way than infection. This avoids the severe damage infection with Covid-19 can sometimes cause and comes without the risk of passing the virus on to others, including patients, friends or family.

The immune response after Covid-19 infection is variable, whereas the response to vaccines is generally strong and consistent².

A mild or asymptomatic case of Covid-19 often produces weak antibody responses that dwindle over time.

However, your body ‘remembers’ the virus, and if you are then vaccinated you develop a very strong and long-lasting response.

This vaccine-boosted response does also gradually reduce over time but evidence shows that it is still likely to remain effective in preventing severe disease for many, many months and possibly for years. This is much better than the protection you get after Covid-19 infection, which reduces more quickly because the virus interferes with the immune system so as to weaken the defences. By contrast, the vaccines just induce a protective response without all the added complexity of infection.

Each time you have a dose of the vaccine it adds to your immune system’s knowledge of the virus, increasing the chance it will recognise it and destroy it before it can do too much harm. That’s why having a vaccine is important even if you’ve had Covid-19 – you can boost your body’s ability to fight it off if you become infected again or avoid serious disease if you become infected with a different variant.

FACT

Covid-19 vaccines are not designed to stop the virus getting into your nose – their primary action is to prevent severe illness.

People who have been fully vaccinated may get mild to moderate Covid-19 infections, with a sore throat or symptoms of a cold. This means the infection has been contained in the nose and throat but has not spread elsewhere.

If a person is not vaccinated there is a much greater chance the infection will spread, for example, to the lungs or other organs. It can then cause inflammation and blood clots inside the blood vessels leading to symptoms such as breathing difficulties, exhaustion and 'brain-fog'. Sometimes this can be prolonged, a condition known as 'long Covid'. This is very rare in people who have been vaccinated.

In the first few weeks after vaccination, protection reaches very high levels, inducing antibodies and T cells, a part of the immune system that helps protect against infection³.

If the response is very strong, it can spill over into the nose and throat and stop the virus from entering the body in the first place. However, that is not the real purpose of vaccination.

The immune system can't maintain this sort of protection indefinitely and the resistance of the nose and throat to infection weakens within a few months. This is because the lining of the nose and throat need to defend against other viruses, fungi and bacteria. These defences have to be very selective – if they weren't, the nose and throat would be inflamed all the time and make too much mucus. However, the antibodies and T cells in the blood remain and the immune system has not forgotten the virus. It will rapidly respond if it does get in and confine the infection to the nose and throat before it can spread.

Those who have recovered from Covid-19 do have some protection from becoming infected again.

Data shows that they may even be slightly more protected than those who have had two doses of the AstraZeneca vaccine. But a recent dose of the Pfizer vaccine, which is broadly what is being offered to healthcare staff, will greatly reduce the chance of testing positive for Covid-19⁴. Though of course protection against infection in the nose and throat still reduces over time as described above. A booster dose on top of either two previous doses or a previous infection will increase the protection against infection but, importantly, continues to further reduce the chance of serious illness.

It is very rare indeed for people who have been fully vaccinated to be admitted to intensive care units with severe Covid-19.

Some people will still become unwell with Covid-19 despite being vaccinated, usually because they have a condition that weakens the immune system. This can include underlying health conditions, immunosuppression and advanced age.

In December 2021, 61 per cent of people in intensive care units in England with Covid-19 were unvaccinated⁵ despite unvaccinated people representing less than ten per cent of the population.

It is very rare for people who have been fully vaccinated to be admitted to intensive care units with severe Covid-19.

ICNARC analysis of Covid-19 admissions (critical care)

England, Wales and Northern Ireland (1 May - 15 Dec 2021)

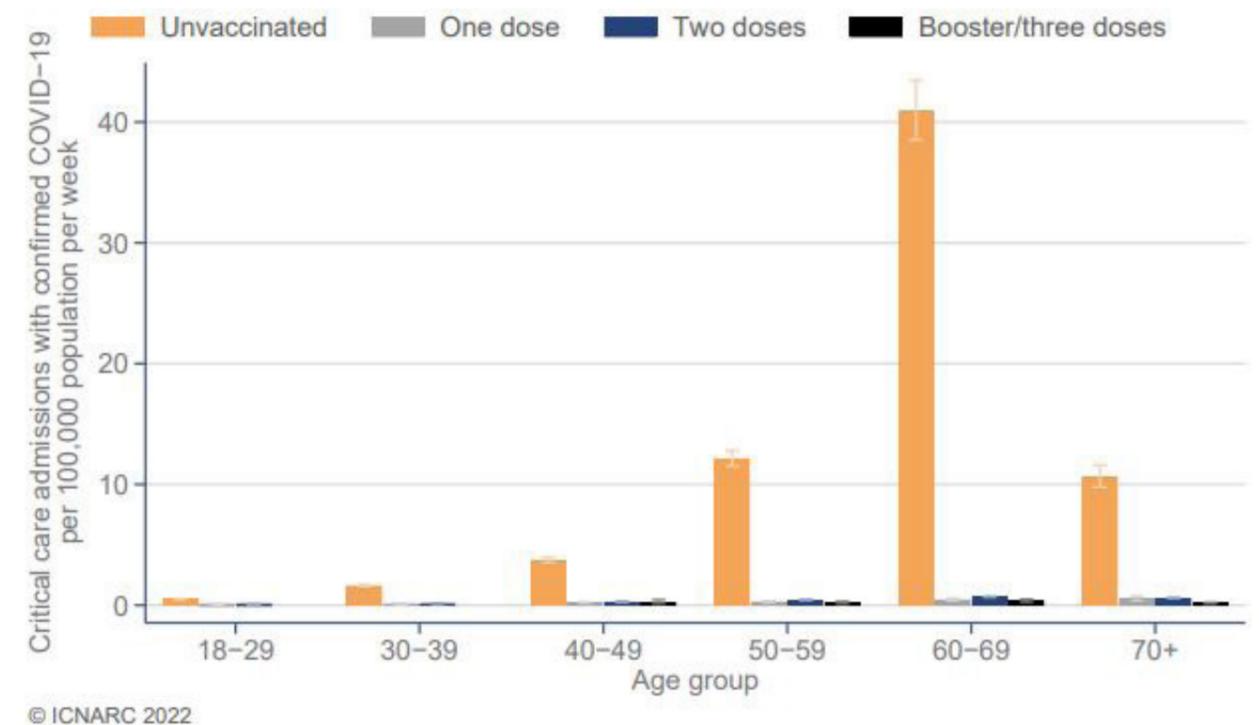


Figure 1: Across all age groups, the vast majority of those in intensive care with Covid-19 had not been vaccinated. Source: ICNARC critical care data.

*Your vaccine helps to protect others -
if you have been vaccinated and you catch
Covid-19, you are less likely to spread it to your
friends, family and patients*

FACT

In addition to reducing your chance of serious illness, being vaccinated does help to protect others too, by reducing the chances of you passing on the virus.

Data from the roll out of Covid-19 vaccination programmes across the world show that the vaccine reduces the chance of serious illness enormously, especially disease that requires intensive care or causes death⁶. Very large and careful studies⁷ on the Alpha and Delta variants of the Covid-19 virus show the very significant effects that vaccines have in stopping people from catching the virus.

The Omicron variant has mutations which mean the vaccine is not as good at stopping people from catching it but the evidence shows it is still very good at protecting you from becoming seriously unwell.

Even though Omicron has around 35 mutations on its spike proteins, a significant part of the virus is the same as the original strain that the vaccines were based on, so it can still be recognised and fought off by the immune system⁸.

It is also clear that vaccinated people who do become infected with Covid-19, including the Omicron variant, are able to respond more quickly, tend to be less infectious and clear their infection faster than unvaccinated people – which also means there is less chance they will spread it to others⁹.

FACT

The Covid-19 vaccines used in the UK have been very carefully evaluated and approved. They are safe, not experimental.

Some people have suggested that the vaccines have been developed without proper testing and there is not enough evidence for their use. This is not true. In the UK, vaccines have to be approved by the independent Medicines and Healthcare products Regulatory Agency (MHRA) before they can be given to the general public. The MHRA reviews all data from extensive clinical trials, including examining all side effects reported by participants and all safety information. A vaccine is only approved if the data shows that it is very safe and this process has been followed in the same way for the Covid-19 vaccine. This does not mean there are no side effects - no medicine or vaccine can claim that.

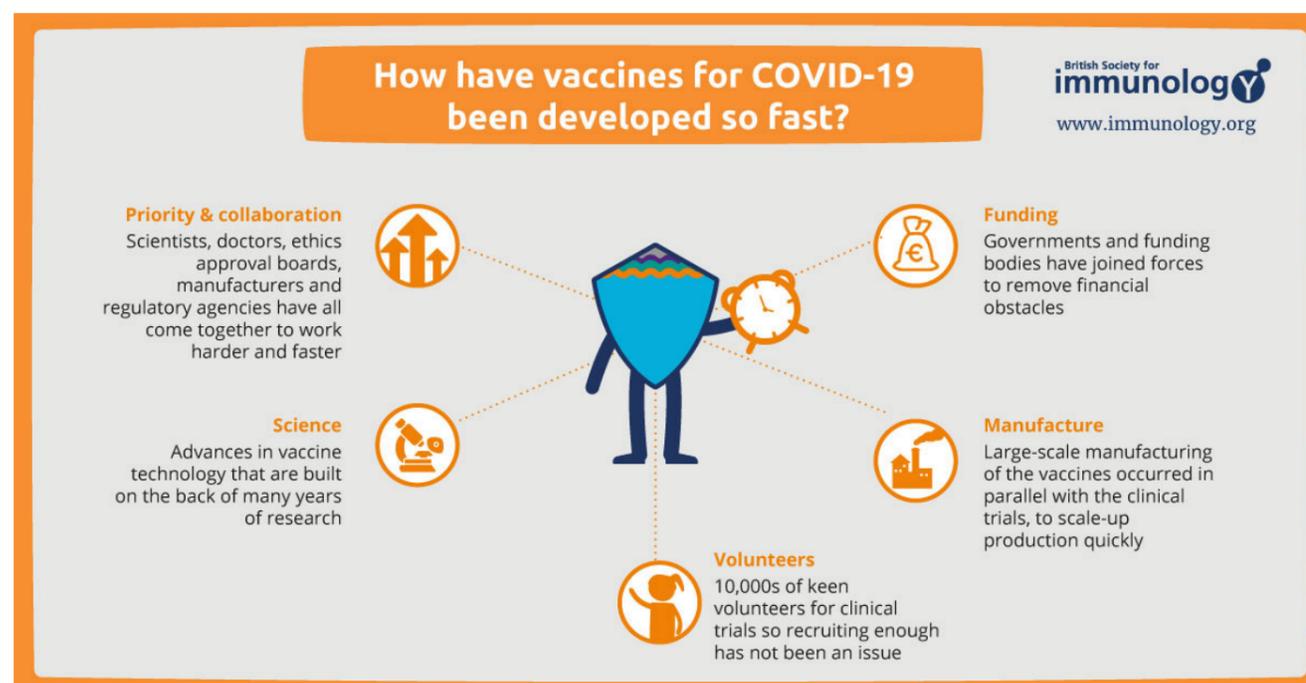
data very fast and reach rapid conclusions. This has not been the case in the past and with other less common infections. There has never been as much effort put into developing vaccines for any other disease, and all this amazing work has paid off.

Regulators, lawyers, administrators and many other groups (including the independent Joint Committee on Vaccination and Immunisation) as well as the MHRA have all prioritised careful evaluation of Covid-19 vaccines and have diverted massive resources to this issue of global urgency. The medical and scientific community and bodies like the MHRA will continue to analyse all the real-world data as it becomes available.

Covid-19 vaccines have been subject to the same approval process as any other vaccine or medicine – they are not experimental.

Studies of the approved Covid-19 vaccines will continue for many years and participants who have received repeated doses will be monitored longer term to see how fast protection declines. This is standard practice and does not mean the vaccines are experimental – research teams have gathered enough data already to prove the vaccines are very safe. In contrast, Covid-19 infection has been shown to do significant short and long-term damage.

The reason approval has been fast is because the world's scientific community has dropped everything to focus on responding to the pandemic. The studies have been done quickly because there are so many cases of infection that researchers can gather lots of



FACT

The approach to vaccines used against Covid-19 has been under development for decades and all the evidence points to long-term safety.

There are lots of suggestions on social media that we have no idea about the long-term effects of vaccines.

Although we can never be sure what will happen over time, all the information we have shows that the vaccines are very safe. That does not mean that scientists are not looking closely for any signal of side effects – quite the opposite. By comparison, the adverse effects of Covid-19 are so clear and common that the balance is completely in favour of vaccines.

The ‘new’ mRNA technology used in the Pfizer BioNTech vaccine has actually been under development for decades, both for vaccines against infection and cancer treatment. These studies have shown no long-term harm. The only thing that is different compared to conventional vaccines is that a small synthetic signal (RNA) is used to mimic the virus, prompting the body’s immune response to develop. The amount of RNA contained in a vaccine is very small compared to the amount in the virus and so does much less damage to your cells – it cannot cause an infection. RNA is a natural molecule that is contained in all your cells. It does not alter your DNA.

mRNA has been in development for decades and has been shown to be safe with no evidence of long-term harm

FACT

Covid-19 vaccines have been shown to be safe in pregnancy and do not impact fertility, while Covid-19 infection has been shown to have adverse impact on pregnancy outcomes.

It is safe to be vaccinated while you are pregnant. At the start of the vaccination programme, the advice was not to have the vaccine if you were pregnant because initially there was not enough data to recommend the vaccine in pregnancy unless you were at very high risk of catching Covid-19. Now that the vaccination programme has been rolled out widely across the world, the data confirms that the vaccine is safe in pregnancy. Recent research has shown, however, that Covid-19 infection can have serious consequences for mother and baby so it's really important to be vaccinated and protect yourself and your baby¹⁰ from Covid-19¹¹.

One especially damaging rumour is that vaccines have an effect on fertility. There really is no reason to think this to be true. There is no evidence and no theoretical basis for the idea that Covid-19 vaccines might affect the fertility of women or men. There has been a lot of research to show that ovaries are not affected by the vaccine and several showing that sperm is not affected either. Covid-19, by contrast, does have adverse effects on pregnancy and potentially reduces sperm quality¹².

There is no evidence or theoretical reason why the Covid-19 vaccine could affect the fertility of men or women.

Further reading

- 1 [COVID-19 immunity: Natural infection compared to vaccination](#)
- 2 [An mRNA Vaccine against SARS-CoV-2 — Preliminary Report](#)
- 3 [SARS-CoV-2 T cell immunity: Specificity, function, durability, and role in protection](#)
- 4 [Public Health England \(PHE\) data and Office for National Statistics \(ONS\), report week 42 \(October 21, 2021\)](#)
- 5 [ICNARC report on COVID-19 in critical care: England, Wales and Northern Ireland 14 January 2022](#)
- 6 [Public Health England \(PHE\) data and Office for National Statistics \(ONS\), report week 42 \(October 21, 2021\)](#)
- 7 [Early effectiveness of COVID-19 vaccination with BNT162b2 mRNA vaccine and ChAdOx1 adenovirus vector vaccine on symptomatic disease, hospitalisations and mortality in older adults in England](#)
- 8 [COVID-19 vaccination & viral variants – British Society of Immunology](#)
- 9 [Virological and serological kinetics of SARS-CoV-2 Delta variant vaccine-breakthrough infections: a multi-center cohort study](#)
- 10 [SARS-CoV-2 infection and COVID-19 vaccination rates in pregnant women in Scotland](#)
- 11 [COVID-19 vaccination in pregnancy – British Society of Immunology](#)
- 12 [British Fertility Society – FAQ 13 January 2022](#)

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Professor Redhead is medical director and consultant in emergency medicine at Imperial College Healthcare. During the pandemic, Professor Redhead was medical director for the north west London integrated care system (ICS) and was one of the leads for north-west London's co-ordinated response to Covid-19 and vaccination. He is now the national clinical director for urgent and emergency care and is responsible for helping the NHS continue to improve urgent care services.

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Mr Anakwe is medical director and consultant trauma and orthopaedic surgeon at Imperial College Healthcare. He chairs the Trust's Clinical Reference Group, set up in response to the Covid-19 pandemic to advise and oversee clinical policy, develop new clinical guidelines and protocols and review changes in clinical practice or new treatments. Mr Anakwe was also a serving medical officer in the Royal Army Medical Corps of the British Army for 24 years.

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Professor Openshaw is a respiratory doctor and expert in immunology, studying how the immune system both protects against viral infection but also causes disease. During the Covid-19 pandemic, Professor Openshaw has led on research to improve the global understanding of the virus and he has also worked on other respiratory viruses such as flu and RSV since the mid-1980s. Professor Openshaw is vice chair of the New and Emerging Respiratory Virus Threats Advisory Group (NERVTAG) in the UK.

