

mRNA Vaccines

How do mRNA vaccines work?

The mRNA vaccines contain instructions that tell our cells to make a protein that is found specifically on the coronavirus (which is the virus that causes the COVID-19 illness). These “spike proteins,” although harmless to us, will trigger our body to start making antibodies. Our new antibodies will protect us from illness if we are exposed to the coronavirus. **The vaccines do not contain the virus** and so they cannot give us COVID-19 ([1](#)).

What is the difference between the Moderna and Pfizer COVID-19 mRNA vaccines?

There is very little difference between the Moderna and Pfizer vaccines, as **they both use the same underlying scientific technology – mRNA.**

- Both brands offer very high effectiveness in preventing COVID-19.
- Both the Pfizer and Moderna vaccine require two shots.
- Both vaccines also have similar common side effects.

The main difference is that they are made by two different brands, Pfizer and Moderna. However, being made by different companies means nothing to the body’s immune response. Our body still responds in the same way, by replicating the spike proteins as instructed by the mRNA in order to protect us.

At this time, Pfizer is approved for use by people aged 12 or older as of 2021, and Moderna is approved for people aged 12 or older at the time of vaccination ([2](#)). Both vaccines have been fully approved by Health Canada.

What evidence do we have that these vaccines work?

Nearly 3 billion people have been vaccinated worldwide. Canada has one of the leading vaccination rates (over 70% of the eligible population). 54 million doses of vaccine have been given and 26.2 million people are fully vaccinated. For more information on research studies, please go to NACI’s (National Advisory Committee on Immunization) [Recommendations on the Use of COVID-19 Vaccines](#) ([3](#))

It is important to note that data from clinical trials of the vaccines as well as population-based research from observational studies of people who have been vaccinated has shown that vaccination is the single best strategy to protect us as individuals as well as society at large. It is always better to prevent a disease versus trying to treat it once you get it.

Safety

The COVID-19 vaccines were made so quickly, how can they be safe?

The use of mRNA technology is not new and the vaccines we are using today have benefited from 10-15 years of strong mRNA research.

The mRNA vaccines were able to be produced and rolled out so quickly because this pandemic affects the entire world. This meant collaboration between the world’s greatest scientists, a lot of funding, and plenty of volunteer participation. Usually, scientific research takes longer due to limited funding and the long time it takes to enroll the number of volunteers needed, which was not a barrier for the COVID-19 vaccines. As of September 8, 2021, 26.3 million Canadians have been vaccinated. World-wide 5.92 billion doses of COVID vaccines have been given. This has provided us with the opportunity to look at safety and side effects in a large number of people. **As a result of people coming together, the COVID-19 vaccines are well tested, safe, and highly effective.**

Aren't the vaccines still experimental?

None of the vaccines are experimental. All vaccines being used in Canada have been fully approved through Health Canada.

Can the vaccine change my DNA profile?

No. COVID-19 vaccines are incapable of altering your DNA or RNA (a molecule similar to DNA). The mRNA vaccines only use your body's normal way to develop antibodies. mRNA vaccines deliver instructions (genetic material) to our cells to start building protection against the virus that causes COVID-19.

Our bodies quickly remove the mRNA as cells do not like keeping this stuff around. It is incapable of entering the nucleus where the DNA is kept. Therefore, it cannot alter your DNA composition or structure ([1,6,7](#)).

Is it safe to mix COVID-19 mRNA vaccines?

Yes. Both Moderna and Pfizer COVID-19 vaccines use mRNA technology, and in June of 2021 Health Canada announced ([3](#)) that these vaccines are safe to mix based on NACI recommendations.

- People who had Moderna or Pfizer for their first dose can safely take **either** Moderna or Pfizer for their second dose for strong protection.
- People who had AstraZeneca for their first dose can safely take **either** AstraZeneca, Moderna or Pfizer for their second dose for strong protection.

In fact, mixing vaccines is very common. For example, different brands of vaccines for hepatitis B or measles are often combined as seen in the [Principles of vaccine interchangeability: Canadian Immunization Guide - Canada.ca](#) ([4](#)).

You can view the following document for more information on mixing mRNA COVID-19 Vaccines: [Why is it OK to mix COVID-19 vaccine brands](#) ([5](#)).

I have chronic conditions, is it safe for me to take the vaccine?

People with chronic health conditions are at greatest risk of developing severe COVID-19. People with stable health conditions (e.g. managed diabetes, high blood pressure, or HIV), and are the most likely to benefit from vaccination. This also includes people with stable hepatitis B or C. People with a weakened immune system due to an illness or medications are advised to speak to their family doctors first as they may require an additional dose of vaccine in order for it to be effective. If you are unsure, you can also **speak with your family doctor or the health professionals at any of our vaccination clinics**. We also do a screening before you are vaccinated and 15 minutes of observation after your vaccination to make sure you are safe and comfortable.

Effectiveness

What is efficacy? What is Effectiveness?

Efficacy of the vaccine is the measure of how well the vaccine works to prevent disease under *controlled circumstances*, by comparing volunteers in a vaccinated group with volunteers in an unvaccinated group. For example, a vaccine with an efficacy of 90% in a study or trial means that there was a 90% decrease in cases of the disease in the vaccinated group compared to the unvaccinated group.

Effectiveness of the vaccine is the measure of how well the vaccine works to prevent disease under uncontrolled circumstances ([8](#)). Effectiveness of a vaccine is measured in real world scenarios instead of studies or trials.

Even though effectiveness may sometimes be lower than efficacy, vaccines do not always need to have a very high effectiveness to be useful. The influenza vaccine is 40-60% effective yet saves thousands of lives every year.

How well do the vaccines really work?

While vaccines provide a high degree of protection from COVID-19 infection, it is expected that a small proportion of vaccinated individuals may become infected, since **no vaccine is 100% effective**. We know that the COVID-19 vaccines work very well in protecting people from COVID-19's serious health effects.

Two weeks after receiving both doses of any mRNA vaccine (i.e. Pfizer or Moderna) your body will have built strong immunity against the harmful effects of the virus. This immune response allows your body to protect you if you come in contact with the virus, and is highly effective in protecting you from becoming *very ill* from the COVID-19 virus (8,9).

It is important to know that protection from COVID-19 infection does not occur immediately after vaccination. **Immunity develops over time**. Vaccine effectiveness is estimated to be 60-80% for preventing COVID-19 infection 3-4 weeks after receiving a single dose. Following the second dose (14 days after the dose), vaccine effectiveness increases to **greater** than 85% (10).

Can vaccinated people still get COVID-19?

While vaccines provide a high degree of protection from COVID-19 infection, it is expected that a small proportion of vaccinated individuals may become infected as no vaccine is 100% effective. When COVID-19 cases occur after vaccination, there is evidence that vaccines reduce how intense your symptoms are, and also better protect you from passing on COVID-19 to others. The vaccine effectiveness for the prevention of serious outcomes such as hospitalizations and intensive care unit (ICU) admissions ranges between 70-90%, which helps us keep our families, friends, and communities safe, and will reduce the burden of COVID-19 on our health care system and may allow us to avoid recurrent lockdowns and waves of infection (10).

Will the COVID-19 vaccines protect me from the variants?

There are different variants of the COVID-19 virus that have impacted our communities, especially the Delta variant. Real-world data shows that **COVID-19 vaccines work better against the variants when two doses are given rather than just one**. Having one dose of the vaccine will offer ~40-70% protection against COVID-19, while having the required two doses will provide ~65-96% protection against COVID-19 and its known variants (11).

What happens if I do not get vaccinated?

COVID can and does cause severe disease. We are currently seeing the majority of hospitalizations in those who are not vaccinated. We also are learning that COVID infection can lead to long lasting effects – long COVID.

Though we cannot predict what happens to each unvaccinated person, we can share data collected on vaccinated and unvaccinated cases in Ontario. Unvaccinated cases accounted for the majority (94.2%) of COVID-19 cases reported since December 14, 2020 and up to September 4, 2021, with fully vaccinated cases accounting for only 1.4%. For hospitalizations and deaths, unvaccinated cases accounted for 92.2% of hospitalizations and 91.7% of deaths, and fully vaccinated cases accounted for only 1.1% of hospitalizations and 1.6% of deaths (10).

Vaccine Reactions

I was told I can get very sick from the vaccine. Is that true?

The mRNA vaccines themselves do not contain any live virus and cannot give you COVID-19.

All COVID-19 vaccines available in Canada have been determined to be safe and effective by Health Canada ([12](#)). This means, Health Canada and the Public Health Agency of Canada share the responsibility for ongoing safety monitoring, which also involves: provincial, territorial and local public health authorities, health care professionals, the vaccine industry and the public.

The benefits of vaccines authorized in Canada continue to outweigh the risks. **Serious safety events occurring after vaccination are extremely rare**, and account for just 0.007% of all doses administered ([13](#)).

What are the side effects of the vaccines?

After vaccination, it is common to experience short-term side effects, although some people do not report any side effects at all. The most commonly reported side effects are:

- Short-lived pain in the area where the vaccine was given (most commonly the upper arm)
- Fatigue
- Headache
- Chills
- Flu-like symptoms

The rare but more severe reactions include anaphylaxis, myocarditis (inflammation of the heart muscle), pericarditis (inflammation of the lining outside the heart), Bell's palsy (facial paralysis) and vaccine-induced thrombocytopenia (low platelets and clotting).

A useful site for additional information on the number of vaccinations in Canada and the number of adverse events (side effects) that have been reported is the [COVID-19 vaccine safety: Summary of weekly report on side effects following immunization - Canada.ca](#) ([13](#)).

I got the vaccine, but I did not have any side effects. Did the vaccine work?

Not all people who receive the vaccine will have side effects. There is no proven relationship between having side effects and protection levels. This means, even if you don't have any side effects, you should still have the expected levels of protection after vaccination as those who do experience side effects ([14](#)).

Doses Required

Why do I need two doses of the vaccine?

Just like other vaccinations with multiple doses, studies have determined that **two doses provide the greatest protection against COVID-19**. It is important to receive both doses of the vaccine to complete the vaccine series. Having one shot does reduce your chances of infection; however, having two shots supports stronger and more long-term protection. The first dose helps your body build immunity and the second dose boosts your immunity. Having one dose of the vaccine will offer ~40-70% protection against COVID-19, while two doses will provide ~65-96% protection against COVID-19 and its known variants ([11](#), [15](#)).

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

Yes, you should be vaccinated regardless of whether you already had COVID-19 because:

- Research has not yet shown how long you are protected from getting COVID-19 *again* after you recover the first time.
- Vaccination helps protect you even if you've already had COVID-19.
- Evidence is emerging that people get better protection by being fully vaccinated compared with having had COVID-19.
- One study showed that unvaccinated people who already had COVID-19 are more than twice as likely to get COVID-19 again than fully vaccinated people ([16](#)).

COVID-19 Vaccine and Pregnancy

Being pregnant during the COVID-19 pandemic can be stressful. It's natural to worry about the effects of the virus on your pregnancy and the health of your child. Evidence shows that it's rare to pass COVID-19 to your baby during pregnancy. However, the risk of severe disease or outcomes appears to be worse with some COVID-19 variants. **It's important to continue regular prenatal visits during COVID-19, even if completed virtually.** If you do get COVID-19 while you're pregnant, you may have an increased risk of more severe disease or outcomes, including the need for intensive care ([17](#)).

Can I get the COVID-19 vaccine if I am pregnant?

COVID-19 mRNA vaccines are safe and recommended for pregnant women, at any stage of the pregnancy. It is advised that pregnant women should get vaccinated as soon as possible ([18](#)). The COVID-19 infection during pregnancy can be severe, and the benefits of vaccination outweigh the risks ([17](#)).

Pregnant women were not a part of the studies, how can vaccinating them be safe?

Pregnant individuals were not included in Phase III trials for COVID-19 vaccines; however, **real-world safety data for hundreds of thousands of pregnant women who have been vaccinated have not revealed any safety risks** ([17,18](#)). It is important that pregnant women are vaccinated as soon as possible. Recent data has reassured us that vaccination does not cause any increase risk of spontaneous abortion ([19](#)). Pregnancy is a known risk factor for the COVID-19 virus and there is strong data showing pregnant women to be at a higher risk for hospitalization, ICU admission, mechanical ventilation, and death compared to non-pregnant individuals ([17](#)).

Can I get the COVID-19 vaccine if I am breastfeeding?

COVID-19 vaccines can also be safely given to breastfeeding individuals. Recent data shows that mRNA from the vaccines does not transfer into breast milk; however, anti-COVID-19 antibodies produced by the breastfeeding person can transfer through the milk and provide protection to the infant. The vaccines are safe for the breastfeeding person, and should be offered to those eligible for vaccination ([18](#)). The World Health Organization recommends that breastfeeding mothers be vaccinated against COVID-19 and does not advise stopping breastfeeding afterward ([20](#)).

Is it true that getting vaccinated will make me infertile?

No, there is no evidence that COVID-19 vaccines, or any vaccines in Canada cause fertility issues ([21](#)). COVID-19 vaccination is recommended for people who are trying to get pregnant now or might become pregnant in the future, as well as their partners.

List of References

1. <https://www.cdc.gov/coronavirus/2019-ncov/vaccines/facts.html#:~:text=None%20of%20the%20authorized%20COVID,virus%20that%20causes%20COVID%2D19>
2. <https://www.canada.ca/en/public-health/services/immunization/national-advisory-committee-on-immunization-naci/recommendations-use-covid-19-vaccines/mrna-adolescents.html>
3. <https://www.canada.ca/en/public-health/services/immunization/national-advisory-committee-on-immunization-naci/recommendations-use-covid-19-vaccines.html>
4. <https://www.canada.ca/en/public-health/services/publications/healthy-living/canadian-immunization-guide-part-1-key-immunization-information/page-7-principles-vaccine-interchangeability.html>
5. https://drive.google.com/file/d/1j94Ve_uyQdtbtzqGa73-fXg1FXtRi8rH/view
6. <https://www.mayoclinic.org/diseases-conditions/coronavirus/in-depth/different-types-of-covid-19-vaccines/art-20506465>
7. <https://www.canada.ca/en/health-canada/services/drugs-health-products/covid19-industry/drugs-vaccines-treatments/vaccines/type-mrna.html>
8. <https://www.who.int/news-room/feature-stories/detail/vaccine-efficacy-effectiveness-and-protection>
9. <https://www.nejm.org/doi/full/10.1056/nejmoa2035389>
10. <https://www.publichealthontario.ca/-/media/documents/ncov/epi/covid-19-epi-confirmed-cases-post-vaccination.pdf?la=en>
11. <https://www.medrxiv.org/content/10.1101/2021.06.28.21259420v1.full.pdf>
12. <https://www.canada.ca/en/public-health/services/vaccination-children/safety-concerns-side-effects.html>
13. <https://health-infobase.canada.ca/covid-19/vaccine-safety/#a1>
14. <https://jamanetwork.com/journals/jamainternalmedicine/fullarticle/2782821>
15. https://www.health.gov.on.ca/en/pro/programs/publichealth/coronavirus/docs/vaccine/Q_A_mixed_heterologous_vaccine_schedules.pdf
16. https://www.cdc.gov/mmwr/volumes/70/wr/mm7032e1.htm?s_cid=mm7032e1_e&ACSTrackingID=USDC_C_921-DM63289&ACSTrackingLabel=MMWR%20Early%20Release%20-%20Vol.%2070%2C%20August%206%2C%202021&deliveryName=USDC_921-DM63289
17. https://www.cdc.gov/coronavirus/2019-ncov/vaccines/recommendations/pregnancy.html#anchor_1628692520287
18. https://www.health.gov.on.ca/en/pro/programs/publichealth/coronavirus/docs/vaccine/COVID-19_vaccination_rec_special_populations.pdf
19. <https://jamanetwork.com/journals/jama/fullarticle/2784193>
20. https://www.who.int/docs/default-source/coronaviruse/act-accelerator/covax/faqs-bf-and-vaccines-aug-18-2021.pdf?sfvrsn=61c3fd92_5
21. <https://www.canada.ca/en/public-health/services/vaccination-pregnancy.html>