The AstraZeneca COVID-19 Vaccine

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Background

The novel coronavirus, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), has affected the entire planet, with close to 111 million confirmed cases and 2.5 million deaths as of 21 February, 2021. Current hospital management is supportive in nature because an effective cure is yet to be identified. Fortunately, at least 7 effective vaccines have now been discovered and tried successfully in humans. Vaccines could play an important role in increasing population immunity, preventing severe disease, and reducing the ongoing health crisis. Malawi is due to receive the AstraZeneca vaccine towards the end of February.

To understand how COVID-19 vaccines work, it helps to first look at how our bodies fight illness. When germs, such as the COVID-19 virus, invade our bodies, they attack it and multiply themselves. This invasion, called an infection, causes our bodies to react by activating our immune system. Our immune system has several tools to fight infection. These tools are found in our blood, and are called white blood cells or immune cells. Different types of white blood cells fight infection in different ways.

The first time a person is infected with the virus that causes COVID-19, it can take several days or weeks for their body to make and use all the germ-fighting tools needed to overcome the infection. After the infection, the person's immune system remembers what it learned about how to protect the body against that disease. The body keeps a few "memory-" cells, that go into action quickly if the body encounters the same virus again. When the familiar virus proteins are detected, immune cells produce antibodies to attack them. Experts are still learning how long these memory cells protect a person against the virus that causes COVID-19.

How COVID-19 Vaccines Work

COVID-19 vaccines help our bodies develop immunity to the virus that causes COVID-19 without us having to get the illness. Different types of vaccines work in different ways to offer protection, but with all types of vaccines, the body is left with a supply of memory cells that will remember how to fight that virus in the future.

It typically takes a few weeks for the body to produce memory cells after vaccination. Therefore, it is possible that a person could be infected with the virus that causes COVID-19 just before or just after vaccination and then get sick because the vaccine did not have enough time to provide protection.

Sometimes after vaccination, the process of building immunity can cause symptoms, such as fever. These symptoms are normal and are a sign that the body is building immunity.

There are different types of vaccines which prompt our bodies in different ways to recognize and protect us from the virus that causes COVID-19.

- **mRNA vaccines** contain genetic material from the virus that causes COVID-19 that gives our cells instructions for how to make a harmless protein that is unique to the virus. After our cells make copies of the protein, they destroy the genetic material from the vaccine. Our bodies recognize that the protein is foreign and induce the body's immune response that is ready toto fight the virus that causes COVID-19 if we are infected in the future.
- **Protein subunit vaccines** include harmless pieces (proteins) of the virus that cause COVID-19 instead of the entire germ. Once vaccinated, our immune system recognizes that the proteins don't belong in the body and begins making memory cells and antibodies. If we are ever infected in the future, memory cells will recognize and fight the virus.
- **Vector vaccines** use a virus that is harmless to humans (such as adenovirus) to carry genetic material from the virus that causes COVID-19 inserted in it (this is called a viral vector). Once the viral vector is inside our cells, the genetic material gives cells instructions to make a protein that is unique to the virus that causes COVID-19. Using these instructions, our cells make copies of the protein. This prompts our bodies to an immune response ready to fight that virus if we are infected in the future.

None of these vaccines can give you COVID-19.
The Oxford AstraZeneca vaccine is made from a weakened version of a common cold virus from chimpanzees, that has been modified to not grow in humans.

What is the efficacy of the vaccine?

Defining vaccine efficacy is not a straightforward task. In the case of SARS-CoV-2, an efficacious vaccine might prevent infection, disease, severe disease, or transmission. The US Food and Drug Administration's (FDA) guidelines indicate that they would license a vaccine against the pandemic virus that showed at least 50% efficacy and the WHO have indicated a minimum efficacy of 50% in its target product profile. A modelling study found that a vaccine with efficacy of 60–80% could allow reduction in physical distancing measures, but this would still require high coverage.

Early data show that the efficacy of the AstraZeneca vaccine is approximately 62.1% (with a range of 41.0% to 75.7%) with a standard, 2-dose schedule, which means it protected 62.1% of people in the clinical trials conducted from developing COVID symptoms.

The term **herd immunity** comes from the observation of how a herd of buffalo forms a circle, with the strong on the outside protecting the weaker and more vulnerable on the inside. This is similar to how herd immunity works in preventing the spread of infectious diseases. Those who are strong enough to get vaccinated directly protect themselves from infection. They also indirectly shield vulnerable people who cannot be vaccinated.

The average number of secondary cases that can develop from a primary case of the virus which causes COVID-19, given by its basic reproduction number (R_0), is thought to be around 2.87. That means, on average, a person with COVID-19 will infect 3 people. Of course, some people infect nobody, while others infect many more in super-spreading events. We'd need to vaccinate at least 65% of the people in Malawi to achieve herd immunity with the AstraZeneca vaccine.

What are possible side effects of the vaccine?

It is important to understand that there is no drug or vaccine that is 100% with any side effects. COVID-19 Vaccine AstraZeneca profile of side effects is similar to that of other vaccines on our immunisation programme. It is given as two injections into the arm, the second between 4 to 12 weeks after the first. The most common side effects with COVID-19 Vaccine AstraZeneca were usually mild or moderate and got better within a few days after vaccination. The most common reactions include injection site pain, headache, tiredness, and muscle aches, usually in the first two days and then resolving within a week after vaccination.

Injection site	Whole body
Very common: injection site bruising, mild to moderate pain, itchiness, achiness, warmth **Common:** injection site redness, swelling **Uncommon:** injection site haematoma (collection of blood under the layers of the skin)	**Very common:** joint pains, chills, fatigue, feverishness, headaches, feeling unwell, muscle pains, nausea **Common:** diarrhoea, fever (temp >38°C), vomiting **Uncommon:** decreased appetite, dizziness, sweatiness, swollen lymph nodes, itchiness, sleepiness, rash

How long does protection from the COVID-19 Vaccine AstraZeneca last?

It is not currently known how long protection given by COVID-19 Vaccine AstraZeneca lasts. The people vaccinated in the clinical trials will continue to be followed for 1 year to gather more information on the duration of protection.

Was the vaccine produced in the right time frame?

There has been ongoing research on viruses with a similar structure to the one that causes COVID-19 such as SARS and MERS. This provided a backbone for developing the current COVID-19 vaccines at a record time.

All vaccines are introduced following thorough approval of safety and efficacy data from clinical data. Surveillance rare side effects that take years to develop continue years after the vaccine has been introduced in the general population as it is done for all vaccines.

Recommendations

Getting vaccinated is one of many steps you can take to protect yourself and others from COVID-19. Protection from COVID-19 is critically important because for some people, it can cause severe illness or death.

Stopping a pandemic requires using all the tools available. Vaccines work with your immune system so your body will be ready to fight the virus if you are exposed. Other steps, like hand hygiene, masks and social distancing, help reduce your chance of being exposed to the virus or spreading it to others.

Information sources

Understanding how COVID vaccines work; CDC. Updated January 13, 2021. https://www.cdc.gov/coronavirus/2019-ncov/vaccines/about-vaccines/how-they-work.html

The Oxford/AstraZeneca COVID-19 vaccine: what you need to know; WHO. February 12, 2021. https://www.who.int/news-room/feature-stories/detail/the-oxford-astrazeneca-covid-19-vaccine-what-you-need-to-know

Merryn Voysey, Sue Ann Costa Clemens, Shabir A Madhi et al. Safety and efficacy of the ChAdOx1 nCoV-19 vaccine (AZD1222) against SARS-CoV-2: an interim analysis of four randomised controlled trials in Brazil, South Africa, and the UK. Published in *The Lancet.*

Maheshi N Ramasamy, Angela M Minassian, Katie J Ewer et al. Safety and immunogenicity of ChAdOx1 nCoV-19 vaccine administered in a prime-boost regimen in young and old adults (COV002): a single-blind, randomised, controlled, phase 2/3 trial. Published in *The Lancet.*

What are the side effects of the AstraZeneca vaccine?; Open Access Government. February 12, 2021. https://www.openaccessgovernment.org/side-effects-of-the-astrazeneca-vaccine/103646/

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