IMMUNITY: A MINI-GLOSSARY

Here are some key terms and their meanings to help journalists explain immunity to a general audience:

IMMUNE SYSTEM:

The complex system in the body, that protects us from foreign substances including infectious diseases caused by bacteria, viruses, fungi, or parasites. Its main function is to identify what type of infectious agent, or pathogen, is causing the infection. It then develops a defence against the pathogen known as the immune response. This involves the production of protein molecules called antibodies to get rid of foreign organisms that invade the body. Crucially, at the same time it produces memory cells that can recognise the same pathogen in future. That sets the immune system up to fight potential reinfections.

INNATE IMMUNITY:

The body's first line of defence, present from birth. This defence mechanism can detect many infectious agents, such as viruses or bacteria as soon as they find their way into the body. Although it may respond quickly the innate system cannot always eliminate infectious organisms and it does not recognise all pathogens.

ADAPTIVE IMMUNITY:

The body's second line of defence which is an essential part of how vaccines work. The adaptive immune system is activated when the innate immune defences are overcome. Unlike the innate immune system which responds immediately, adaptive immunity is activated over five to 10 days. It also targets a specific pathogen (germ).

If the immune system determines that an antiviral response is needed, it launches a combination of two kinds of immunity, one being humoral, mediated by antibodies and the other mediated by T-cells, known as cell-mediated.

The antibodies bind to viruses and neutralise them, preventing them from infecting cells. Meanwhile, T-cells kill cells that have already been infected by the virus.

While both kinds of immunity are important in fighting viruses, cell-mediated immunity is far more effective at eradicating viruses and offers more durable protection. The robustness of T-cell immunity is becoming more important for the development of vaccines in the fight against COVID-19.

With vaccination or infection with COVID-19, the body produces both types of protective immune responses. The first type involves B-cells, which produce antibodies and the second involves T-cells.

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ANTIBODY:

A Y-shaped protein found in the blood that is produced by B-cells in response to invading substances e.g., bacteria or viruses invading the body.

Much like a lock and key, antibodies can directly bind to a virus – or to the spike protein of SARS-CoV-2, in the case of the mRNA vaccines – and prevent it from entering cells. However, once a virus successfully enters the cells, antibodies are no longer effective. The virus begins replicating in the infected cells and spreading to other cells.

This is when the immune system summons another type of immune cell known as T-cells. Unlike antibodies, killer T-cells cannot directly "see" the virus and thus cannot prevent a virus from entering cells. However, the killer T-cells can recognize a virus infected cell and immediately destroy the cell before the virus gets a chance to replicate. In this way, killer T-cells can help prevent a virus from multiplying and spreading.

Once the adaptive immune system has defeated the invader, a pool of long-lived memory T-cells and B-cells are made. These 'memory lymphocytes' remain dormant until the next time they encounter the same pathogen. This time, though, they produce a much faster and stronger immune reaction. Memory is the key feature of the adaptive immune system, enabling long-term protection.

ACTIVE IMMUNITY:

Active Immunity results when exposure to a disease organism triggers the immune system to produce antibodies to that disease. Active immunity can be acquired through natural immunity or vaccine-induced immunity:

- **Natural immunity** is acquired from exposure to the disease organism through infection with the actual disease.
- **Vaccine-induced** immunity is acquired through the introduction of a killed or weakened form of the disease organism through vaccination.

In both instances, if an immune person comes into contact with that disease in the future, their immune system will recognize it and immediately produce the antibodies needed to fight it. Active immunity is long-lasting, and sometimes life-long.

POPULATION IMMUNITY:

Population Immunity, also known as 'herd immunity', is when a significant percentage of the population has been exposed to an infection and recovered from disease or when most people have been vaccinated. In other words, they have acquired immunity from infection. Achieving population immunity means the infectious agent has less opportunity to spread within the population.

Initial estimates for achieving population immunity for COVID-19 were between 60-70% of the population gaining immunity, either through vaccinations or post exposure to the virus. But that thinking has shifted. It has become more of an "aspiration" than a "goal". Experts now believe it will likely be difficult to achieve population immunity for COVID-19 because:

- The virus has evolved, and some mutations have made the virus more transmissible or infectious.
- The virus has shown an ability to have mutations that make it resistant to antibody neutralising activity induced by past infection from the original virus, as well as antibody responses induced by most of the current COVID-19 vaccines.
- Waning protection
- Inequitable distribution of vaccines, slow uptake and delayed rollout of vaccines provides fertile ground for the ongoing evolution of the virus.

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WANING IMMUNITY:

Waning Immunity is the loss of protective antibodies over time. After an infection or vaccination, the body keeps building up its immune defence. The B-cells keep producing antibodies specific to the virus for some time. But when they do not encounter the pathogen for an extended period, they slow down production and the cells and proteins gradually die off causing the body's immunity to start to wane.

After antibody levels fall, a small number of B-cells and T-cells remain as "memory cells," which can live for months, years and sometimes even decades. If the virus returns (or a booster shot is given), these cells can rapidly ramp up the immune response. But if they do not see the virus again, or the immune system is not boosted, they will also eventually start to die, and immunity will wane further.

Experts say that memory responses for SARS-CoV-2 last for at least six to nine months. However, this does not guarantee that they will protect against variants that are evolving.

During the COVID-19 epidemic, the Delta and Omicron variants have deftly been able to evade the immune system defences in both vaccinated individuals and those who have recovered from infection. Booster doses have been introduced to beef up the immune response.

VACCINE-INDUCED IMMUNITY VS NATURAL IMMUNITY:

SARS-CoV-2 variants having been able to escape the body's immune defences making vaccines less effective in preventing infection. However, vaccines remain effective in preventing severe disease and death. Some people who are opposed to vaccines say that if vaccines do not protect against infection, why bother? They argue that it's better to get immunity from natural infection.

However, individuals who are vaccinated, but still get infected have a lower viral load (a lower amount of the virus). This means they are less infectious or less likely to transmit the virus and are also infectious for a shorter period compared to unvaccinated individuals.

A *New England Journal of Medicine* study has shown that if a person who is infected has been vaccinated with at least two doses of the Pfizer vaccine, he or she has a 68% lower chance of spreading the virus to his or her contacts, especially household contacts compared to those who are unvaccinated.

Antibodies acquired with natural infection also begin waning faster - within two to three months - compared to vaccine-derived immunity which wanes at a much slower rate of up to six months.

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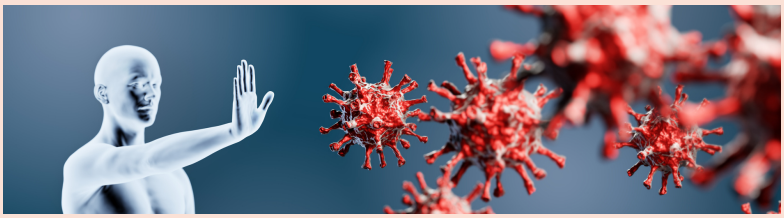
HYBRID IMMUNITY

Immunity is the immune protection acquired in individuals who have had one or more doses of a COVID-19 vaccine and had at least one SARS-CoV-2 infection before or after vaccination. Science experts say this is the "best form of immunity" there is. Studies have shown these individuals have almost 100-times higher levels of antibodies and the period at which immunity wanes is a also much longer.

A study in the *New England Journal of Medicine* compared individuals with past infection with individuals who had past infection plus a vaccine. The study found that the breakthrough infection rate is much higher in individuals with natural infection.

If people who have had a natural infection get vaccinated, they will get protection that's much higher than natural immunity on its own against a new infection. The data are very clear. If you've had a past infection, getting a vaccine gives the best protection against a new infection.



Have you seen the
Internews COVID-19 Glossary?

This glossary is intended for journalists, content creators, and health communicators to use to report on the COVID-19 pandemic and related issues. The information is based on rigorous science and is a useful tool for countering misinformation.

The glossary terms can be accessed alphabetically, by category or cross-reference, or by search.

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