IMMUNITY: A MINI-GLOSSARY

Here are some basic 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 gaining entry into 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 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.

HERD IMMUNITY:

Herd Immunity, also known as 'population 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 herd immunity means the infectious agent has less opportunity to spread within the population.

Initial estimates for achieving herd 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 herd 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.

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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