Immune system and COVID 19

November 19, 2020

What is the immune system?

The immune system is a complex network of cells, tissues, and organs. Together they help the body fight infections and other diseases. When germs such as bacteria or viruses invade your body, they attack and multiply.

Types of the immune system

There are three different types of immunity:

Innate immunity:

- It is the protection that a person is born with. It is our body's first line of defense. It includes barriers such as the skin and mucous membranes.
- They keep harmful substances from entering the body.
- It also includes some cells and chemicals which can attack foreign substances.

Active immunity, also called adaptive immunity:

- It develops when you are infected with or vaccinated against a foreign substance.
- Active immunity is usually long-lasting. For many diseases, it can last your entire life.

Passive immunity:

- It happens when you receive antibodies to a disease instead of making them through your own immune system.
- For example, newborn babies have antibodies from their mothers. People can also get passive immunity through blood products that contain antibodies.
- This kind of immunity gives you protection right away. But it only lasts a few weeks or months.

How does our immune system respond to virus infections?

- Our immune system responds to virus infections with a **first-line defence called 'innate' immunity, followed by the second-line called 'adaptive' immunity.**
- **Innate immunity is like first aid** – an immediate response, **not strong enough to prevent pathology** if the virus is highly virulent or the 'inoculum'(infecting virus load) is heavy.
- Innate immunity then passes the baton to adaptive immunity, which takes several days to develop and become effective.
- **Adaptive immunity has two arms: 1) Antibodies and 2) T-cell immunity.**
    - **Antibodies are protein molecules that recognise and bind to viral antigens**. Some among them tend to neutralise viruses from infecting fresh host cells.
    - Some viruses then adopt other mechanisms to infect host cells, and that is when T-cell immunity may come to the rescue.
    - In most viral infections, the presence of antibodies in the blood is sufficient to classify individuals as immune. But unlike them, antibodies for COVID-19 wane fairly soon.
    - In persons with asymptomatic infections or mild COVID-19, nearly half will have no detectable antibodies after two months. This phenomenon of short-lived antibodies and consequent re-infection is also seen in some other respiratory tract viruses.
    - Generally, re-infections are mild or asymptomatic, presumably due to protection afforded by T-cell immunity

Covid-19 & T-cell Immunity

- In COVID-19 infection, T-cell immunity is more long-

lasting than antibodies. It resides in a subset of white blood cells called T-lymphocytes, or T cells. However, the test for assessing T-cell immunity is complicated and expensive.

- Researchers from Cardiff University have come up with a simplified and rapid T-cell immunity test, called ‘T-SPOT test’, that can be done in many laboratories. Serial evaluation of T-cell immunity can help determine its durability after vaccination
- In a recent study from Karolinska Institute, there were many surprises. About 25% of blood donors in 2019, prior to the outbreak of COVID-19 infection in Sweden, had T-cell immunity against it.
- This increased to 50% in 2020 after the pandemic had entered the country.
- These observations imply that prior exposure to some other coronavirus(es) had evoked “cross-reacting” T-cell immunity towards the COVID-19 coronavirus.
- In the same study, many contacts of proven COVID-19 patients had T-cell immunity, even though antibodies were undetectable.
- This indicates that in those exposed to the COVID-19 virus, T-cell immunity occurs even without a detectable antibody response.
- The Karolinska investigators found that the immune T cells had ‘stem-cell’ like characteristics – indicating their long-term survival and potential of quick multiplication.
- Therefore T-cell immunity is a better and more durable marker than antibodies of past infection for this novel virus.