

Immune imprinting

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In news - A slew of recent studies has shown that a phenomenon in our bodies, called immune imprinting, might be making these new boosters far less effective than expected.

What do these studies say?

- Recently studies pointed out that bivalent boosters made to counter both the Omicron strains and the original Covid-19 strain – don't generate significantly greater antibody responses than an additional dose of the original mRNA vaccines.
- The observed ineffectiveness of the bivalent or variant-specific boosters might be due to immune imprinting, scientists of both studies concluded.

What is immune imprinting?

- **Immune imprinting is a tendency of the body to repeat its immune response based on the first variant it encountered through infection or vaccination.** when it comes across a newer or slightly different variant of the same pathogen.
- **The phenomenon was first observed in 1947**, when scientists noted that people who had previously had flu, and were then vaccinated against the current circulating strain, produced antibodies against the first strain they had encountered.
- At the time, **it was termed the 'original antigenic sin' but today, it's commonly known as imprinting.**
- Over the years, scientists have realised that imprinting acts as a database for the immune system, helping it put up a better response to repeat infections.
- **After our body is exposed to a virus for the first time, it produces memory B cells that circulate in the bloodstream and quickly produce antibodies** whenever the same strain of the virus infects again.

- The problem occurs when a similar, not identical, variant of the virus is encountered by the body.
- In such cases, the immune system, rather than generating new B cells, activates memory B cells, which in turn produce antibodies that bind to features found in both the old and new strains, known as **cross-reactive antibodies**.
- Although these cross-reactive antibodies do offer some protection against the new strain, they aren't as effective as the ones produced by the B cells when the body first came across the original virus.

How to circumvent immune imprinting?

- Currently, several ongoing studies are trying to find a way to deal with imprinting.
- **Some scientists have said nasal vaccines might be better at preventing infections** than injected ones.
- They believe the mucous membranes would create stronger protection, despite carrying some imprint of past exposure.
- Researchers are also trying to find if spacing out coronavirus vaccine shots on an annual basis, could help with the problem of imprinting.
- There's also considerable effort directed toward developing what's called pan-sarbecovirus vaccines that will protect against all COVID-causing variants and maybe even protect against other SARS and related viruses.