

Do you need another COVID-19 booster?

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Northeastern community members receive a first dose of the Moderna COVID-19 vaccine at the Cabot Testing Center. Credit: Matthew MODOONO/Northeastern University

As the U.S. enters its third year of the pandemic, COVID-19 cases are at an all-time high thanks to the highly transmissible omicron variant.

Unlike earlier phases of the pandemic, large-scale government interventions such as lockdowns and business closures have fallen off—even as the country logs record-breaking caseloads by the day. Health officials and the public at large are now leaning heavily on the protections conferred by the vaccines to keep hospitalizations and deaths at bay.

That's why many are scrambling to get boosted. But those with compromised immune systems fear a second or third shot may not induce an [immune system](#) response adequate to provide protection, [leading some](#) to seek out unauthorized fourth—and even fifth—shots.

With the rise in omicron, U.S. officials have been talking about the need for a second booster, or a fourth shot, to follow the two-dose regimen of Pfizer-BioNTech or Moderna plus the initial booster. Which begs the question: Is it possible to overstimulate the immune [system](#) with too many jabs?

"Theoretically, if you give too many vaccines in too short a [time period](#), it can decrease or dampen the immune response, rather than increase it," says Todd Brown, vice chair of the Department of Pharmacy and Health Systems at Northeastern. That means that the immune system may be less likely to respond to other threats due to the repeated activation, Brown says.

Both types of shots—messenger RNA (mRNA) and viral vector—work to get the immune system to recognize a threat without actually infecting a person with a virus or other pathogen. The Pfizer-BioNTech and Moderna vaccines, which are mRNA vaccines, teach cells to create a portion of the coronavirus spike protein, which then triggers the immune system to respond so that it's ready if the real virus shows up. The single-dose Johnson & Johnson vaccine, which is a viral vector vaccine, trains the body's defense network in a similar way, but uses a deactivated virus

to do so instead of genetic material.

In order for the immune system to recognize and ward off the actual coronavirus, it must have a reserve of memory lymphocytes, called the B cells and T cells. The vaccinated immune system uses these cells to help create neutralizing antibodies. Once the [vaccine](#) has trained the immune system, these memory cells remain dormant in the body for long periods of time.

"What you want is to get the 'memory' part of your immune system to work, so the B cells and the T cells," Brown says. "Your immune system is not just antibodies."

How long these antibodies last, and whether a person is capable of producing them in the first place, all depends on immune system function. Some [immunocompromised patients](#), despite being "triple vaxxed," still haven't been able to produce enough antibodies to ward off the virus. These concerns and others have led some people to find creative, albeit unauthorized, ways to receive added doses within relatively short periods of time, the [New York Times](#) reported on Monday, which goes against the current guidance by the Centers for Disease Control and Prevention.

But elsewhere in the world, new research is emerging about the potential efficacy of a second booster. On Sunday, Israel approved a fourth jab in the 60-plus population, which would be administered four months after the third shot. Israeli officials on Tuesday [shared preliminary evidence](#) from a study showing that the fourth shot generated "a fivefold jump" in antibody production one week after administration.

Some public [health officials](#) have criticized the move as premature, adding that further allocation of boosters would divert resources away from efforts to provide shots to underserved parts of the world. Also,

there is not enough evidence supporting a change in the current guidance in the U.S., says Mansoor Amiji, university distinguished professor of pharmaceutical sciences and chemical engineering at Northeastern.

The safety and efficacy of a second booster remains an open question, Amiji says, noting that there are more risks associated with repeated boosting in shorter periods of time, including dampening the [immune response](#). That means fewer T cells and B cells, and less antibody production.

"The concern is when you start to dose these vaccines at a very short frequency, not only will your [cells](#) be exposed to a lot more mRNA than usual, but there are potential adverse side-effects," Amiji says.

"Depending on how many of these doses you administer, you could risk building a tolerance" to the vaccines.

Provided by Northeastern University

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