Omicron-specific vaccines may give slightly better COVID protection, but getting boosted promptly is the best bet

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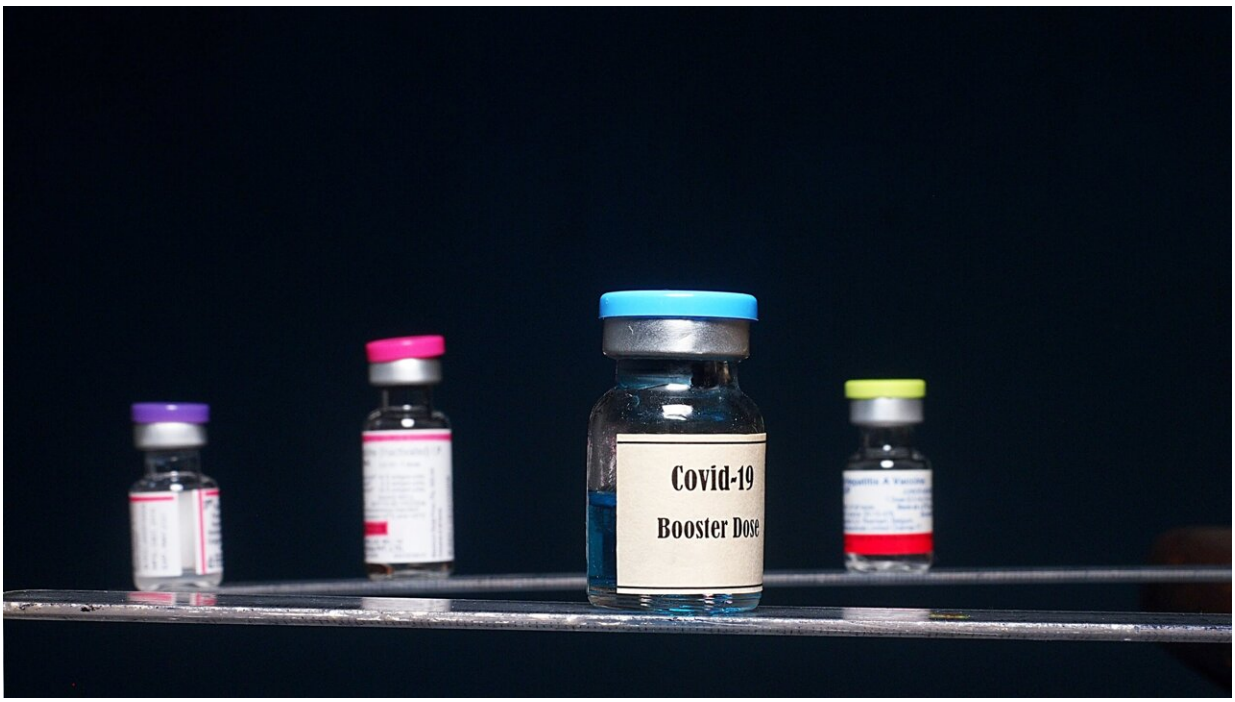

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Vaccines (predominantly mRNA vaccines) have been our front-line defense against COVID and have saved millions of lives.

Despite the emergence of genetically distinct COVID variants

throughout the pandemic, we've relied on vaccines that target the spike protein from the virus originally detected in Wuhan, China. While still providing excellent protection, mRNA vaccines are less effective against newer variants with immunity waning within months of immunization.

Australia's omicron bivalent (two-strain) COVID vaccine has been approved for use and will be rolled out as stocks of the original vaccines need replacing.

While we hope they will provide better protection than existing vaccines, the little data we have so far suggests they only provide slightly better protection.

So, if you're eligible for your fourth dose, it makes sense to get boosted with whichever COVID vaccine you're offered now—rather than waiting until the omicron-specific boosters enter circulation.

Playing catch up with new variants

One key technological advance with mRNA vaccines is the ability to modify the mRNA sequence that encodes the spike protein in SARS-CoV-2 (the virus that causes COVID). This means scientists can target the viral spike protein and respond to the viral variants currently circulating.

But it still takes time to manufacture a recalibrated mRNA vaccine, then test it, distribute it and get it into people's arms.

Earlier in the pandemic, Moderna produced a bivalent vaccine that also targeted the Beta variant. Initial lab tests showed boosting with this variant-specific vaccine increased antibodies against Beta approximately two times better than the boost provided by the original vaccine.

However development was discontinued because Beta was replaced by other COVID variants.

As long as SARS-CoV-2 evolves, keeping up with it is going to remain a challenge for variant-specific vaccines.

Testing new vaccines now

So how do scientists determine if bivalent vaccines work better than existing vaccines?

The gold standard is a clinical trial that assesses protection from disease. Early in the pandemic when few people had immunity to SARS-CoV-2, this was relatively straight forward. Starting with a baseline of no immunity makes it easier to design a trial to assess the protection provided by vaccines.

The situation is a lot more complicated now, with much of the world's population vaccinated, previously infected or both—often multiple times.

Measuring relative effectiveness in a clinical trial comparing two vaccines in such a diverse population exposed to unpredictable waves of infection requires large numbers of study participants—and lots of time and money.

As an alternative, we can examine indicators of protection. Antibodies are generated by the immune system when we're exposed to the SARS-CoV-2 spike protein, either via vaccination or infection. The aim is to generate lots of antibodies that bind to the surface of the spike protein and stop the virus infecting cells.

Scientists can recruit study participants who know their vaccination and

infection history and take their baseline antibody levels. Then they can be boosted with either the standard mRNA vaccine or the variant-modified bivalent vaccine. The level of virus-neutralizing antibodies in the blood can then be assessed in the lab after boosting.

How effective is the omicron booster?

The Moderna COVID bivalent booster targets the ancestral virus and omicron BA.1 subvariant. It has been approved for use in Australia and will be rolled out when our stocks of existing Moderna boosters have been exhausted.

The bivalent vaccine will then be offered to adults who are due to have their third or fourth doses.

Lab-based studies assessing antibody responses suggest the bivalent vaccine offers 1.5 to 2 times improved immunity over the boost provided by the original vaccine.

> Wish this was true. What's over is @POTUS's and our government's will to get ahead of it, with magical thinking on the new bivalent boosters. Ignores #LongCovid, inevitability of new variants, and our current incapability for blocking infections and transmission https://t.co/sZyChorhC9
>
> — Eric Topol (@EricTopol) September 19, 2022

However, it's unclear how much better they will be than existing boosters at protecting people from disease, particularly given BA.1 has been replaced by omicron sub-variants. These have several mutations that distinguish them from BA.1 and so the bivalent omicron vaccine is no longer a perfect match.

To try and understand vaccine effectiveness in the absence of a dedicated clinical trial, researchers can model the relationship between lab-based antibody studies and previous clinical trials to predict how well new vaccines will protect from disease.

This type of analysis shows the original vaccine is quite good at restoring protection against disease caused by different variants when given as a booster.

Variant-modified vaccines such as the newly approved omicron booster are predicted to improve that by 5–10%, depending on the variant and level of existing immunity. This might seem like a small improvement but it could mean additional lives saved.

That said, you are at much greater risk of disease if it has been several months since your last booster. That's why it's best to get boosted as soon as you're eligible, rather than waiting for an Omicron-specific booster.

What might come next for the vaccine rollout?

The government has accepted the Australian Technical Advisory Group on Immunization (ATAGI) advice to wait until current Moderna booster stocks run out before putting the bivalent omicron boosters into circulation.

This seems like the right call, given the omicron boosters probably offer only a modest improvement in protection against the omicron sub-variants currently circulating.

In the future we might see annual COVID boosters adapted to the currently circulating strains or predicted strains, like season flu shots. There appears to be a desire to do this in the United States with the Federal Drug Administration fast-tracking authorization of booster

mRNA vaccines that target the omicron BA.4/BA.5 subvariants, before data is available on how well they work.

Rather than constantly updating COVID vaccines, an alternative approach is to develop a "variant-proof" vaccine that targets multiple SARS-CoV-2 variants. We could combine this with treatments like nose sprays that stimulate immunity against a range of viruses.

For now, bivalent vaccines work as well, if not a little better, than the original vaccines so transitioning to them makes sense.

Provided by The Conversation