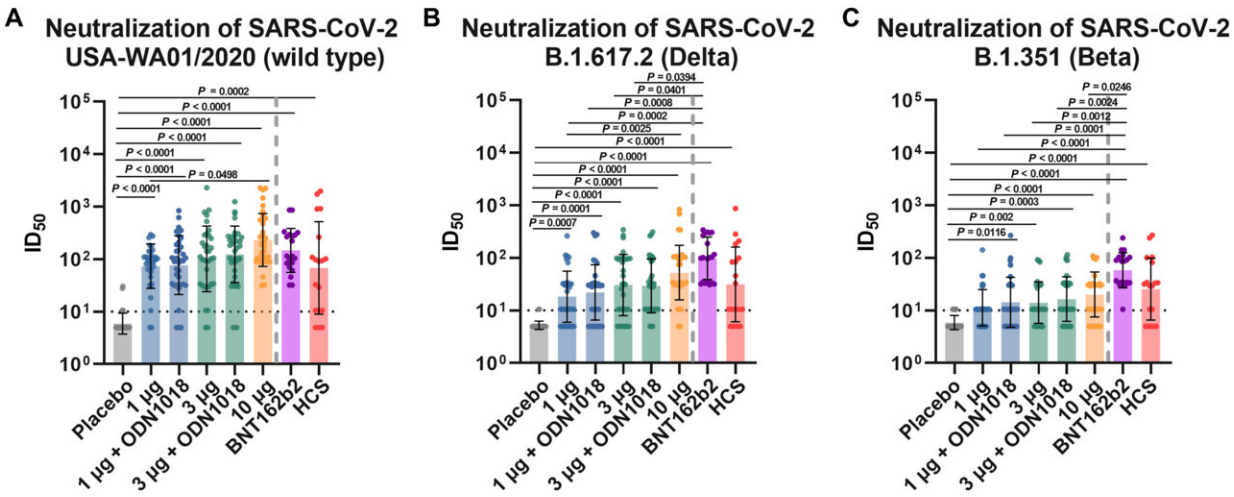
Study: Experimental COVID shot made via egg-based technology elicits higher antibody proportion than mRNA vax

March 16 2023, by Delthia Ricks



Neutralizing activity of vaccinee and convalescent serum samples against wild-type SARS-CoV-2 and Delta and Beta variants.Neutralization was measured against (**A**) wild-type SARS-CoV-2 strain USA-WA01/2020, (**B**) a Delta (B.1.617.2) isolate, and (**C**) a Beta (B.1.351) isolate in a microneutralization assay with authentic SARS-CoV-2. For vaccine groups, $n = 35$, $n_{BNT162b2} = 20$, and $n_{HCS} = 18$. The exception is $n_{3\ \mu g} = 34$ in (B) and $n_{3\ \mu g} = 31$ in (C); $n_{1\ \mu g} = 34$ and $n_{3\ \mu g + ODN1018} = 34$ in (C); and the $n_{placebo} = 34$ in (A) and $n_{placebo} = 32$ in (B) and (C), due to a lack of sample volume. Bars show GMT, and error bars indicate SD of the GMT. The horizontal dotted lines indicate the limit of detection; values below the limit of detection were assigned a value of half of the limit of detection. For statistical analysis, log-transformed neutralization titers were compared using a Kruskal-Wallis test corrected for multiple comparisons using Dunn's multiple comparisons test. *P* values for significant differences are

indicated in the panels. Experiments were performed once. The vertical dashed lines indicate that the samples on the left are from the clinical trial in Thailand, whereas the samples on the right are from the PARIS study in New York City. Credit: *Science Translational Medicine* (2023). DOI: 10.1126/scitranslmed.abo2847

An experimental COVID-19 vaccine produced with technology based on a decades-old method, elicited virus-neutralizing antibodies in higher proportion than the amount induced by mRNA immunizations, a Phase 1 clinical trial has found.

The investigational vaccine was developed in New York City and tested in Thailand where the shots were produced using a form of egg-based technology. The fact that researchers are still racing to develop new COVID-19 vaccines highlights an ongoing need, especially in low- and middle-income countries—and for good reason.

A surprising slew of omicron subvariants has emerged since 2021. Last year, omicron spawned a dizzying number of subvariants: BA.5, BQ.1, and BQ.1.1. By January of this year, a new omicron subvariant called XBB.1.5 was sweeping across the United States and beyond.

"A large number of vaccines for SARS-CoV-2 have been developed and licensed," asserted Juan Manuel Carreño, writing with a team of researchers in *Science Translational Medicine*. As a research scientist in the microbiology department at Mount Sinai's Icahn School of Medicine in New York City where the vaccine was developed, Carreño underscored the need for effective and affordable COVID shots in overlooked regions of the world.

"There is a need for SARS-CoV-2 vaccines that can be produced at low

cost locally in low- and middle-income countries," added Carreño, lead author of the new analysis. The study analyzed antibody responses elicited by the investigational vaccine known as NDV-HXP-S, which is produced in hens' eggs.

The research found that the investigational vaccine prompted a higher proportion of neutralizing antibodies against SARS-CoV-2 in volunteers compared with the proportion of neutralizing antibodies produced by a separate group of people who were vaccinated with Pfizer's mRNA vaccine.

A neutralizing antibody is one that defends healthy cells from a virus by neutralizing the pathogen's efforts to get inside. For instance, a neutralizing antibody can stop a virus from making a conformational change—swapping its structure for a new shape. Viral shape-shifting is a way to infect a cell.

Neutralizing antibodies differ from binding antibodies, which latch onto the pathogen and alert warrior cells of the immune system that a viral invasion is underway. While people who were vaccinated with NDV-HXP-S had a higher proportion of neutralizing antibodies, their binding to neutralizing antibody ratios were lower than those who were vaccinated with Pfizer's mRNA vaccine. When all variables were taken into account, the team concluded that the antibody responses between the two vaccines were comparable.

Findings from the research suggest that even in regions with previously limited vaccine-production infrastructure, it's possible to manufacture robust COVID shots at low cost. Western countries averse to technology sharing early in the pandemic, a factor that left scores of people in low- and middle-income countries with few opportunities for vaccination. Now, the tide is turning, albeit three years after the global SARS-CoV-2 pandemic was declared.

"Locally produced vaccines can increase vaccine access and vaccine independence, especially for low- and middle-income countries," Carreño added. "The NDV-HXP-S vaccine is designed to help close this gap because it can be economically produced in influenza vaccine manufacturing plants that are located in [these countries]. Moreover, it can be stored and distributed without the need for freezers."

Although mRNA vaccines have dominated the U.S. response to the pandemic, the technology underlying those shots is expensive. The finicky, temperature-sensitive ingredients required for mRNA vaccines may be difficult to store in far-flung regions of the globe. To address the global need for a low-cost vaccine that can be produced locally, scientists have been developing alternatives, such as NDV-HXP-S.

The vaccine's initials, NDV-HXP-S, stand for Newcastle disease virus, HexaPro, and spike protein. Producing the vaccine involves a vector, which in this case is the Newcastle disease virus, an agent that infects birds. The vaccine is manufactured by way of egg-based technology, which has been used for decades to produce annual flu shots. The Newcastle viral vector is not used in the production of influenza vaccines.

The vector works exquisitely well in the NDV-HXP-S production process, ferrying vaccine components into embryonated chicken eggs. The result, in the case of the vaccine used in Thailand, is an inactivated vaccine, which is a viral particle displaying SARS-C0V-2's spike protein on its surface.

"NDV-HXP-S can be used as a live vaccine or as an inactivated vaccine," Carreño explained, noting in *Science Translational Medicine* that clinical trials with a live version of the vaccine are ongoing in Mexico and the United States. As in Thailand, clinical trials in Vietnam and Brazil involve an inactivated form of the vaccine.

The NDV-HXP-S immunization was developed at Mount Sinai's Icahn School of Medicine in New York City by world-renowned virologists and vaccinologists, Drs. Peter Palese, Adolfo Garcia-Sastre and Florian Krammer, all leading members of the current clinical research.

The team analyzed antibody responses after Thai volunteers were vaccinated in the phase 1 clinical study. Researchers studied serum samples from 210 Thai volunteers who received either a placebo or the inactivated NDV-HXP-S vaccine.

They compared antibodies from the Thai volunteers to those from 20 people who received the Pfizer mRNA vaccine in New York City. Antibodies elicited by NDV-HXP-S tended to target the receptor binding domain of the virus rather than the spike protein's S2 subunit, the researchers found.

"Neutralizing activity of sera from NDV-HXP-S vaccinees was comparable to that of [Pfizer] vaccinees, whereas spike protein binding activity of the NDV-HXP-S vaccinee samples was lower than that of sera obtained from mRNA vaccines," Carreño and colleagues wrote. "This led us to calculate ratios between binding and neutralizing antibody titers.

"In summary, we show that a vaccine candidate that can be produced locally in [low- and middle-income countries] at low-cost induces neutralizing antibody titers to SARS-CoV-2 comparable to those observed in cohorts having received mRNA-based COVID-19 vaccines," Carreño concluded.

More information: Juan Manuel Carreño et al, An inactivated NDV-HXP-S COVID-19 vaccine elicits a higher proportion of neutralizing antibodies in humans than mRNA vaccination, *Science Translational Medicine* (2023). DOI: 10.1126/scitranslmed.abo2847

Citation: Study: Experimental COVID shot made via egg-based technology elicits higher antibody proportion than mRNA vax (2023, March 16) retrieved 18 March 2023 from https://medicalxpress.com/news/2023-03-experimental-covid-shot-egg-based-technology.html