NEWS · 19 FEBRUARY 2021

Can COVID vaccines stop transmission? Scientists race to find answers

Controlling the pandemic will require shots that prevent viral spread, but that feature is difficult to measure.

Smriti Mallapaty

Vaccines that can block viral transmission will help control the pandemic. Credit: Andrea Fasani/EPA-EFE/Shutterstock

As countries roll out vaccines that prevent COVID-19, studies are under way to determine whether shots can also stop people from getting infected and passing on the SARS-CoV-2 virus. Vaccines that prevent transmission could help to bring the pandemic under control if they are given to enough people.

Preliminary analyses suggest that at least some vaccines are likely to have a transmission-blocking effect. But confirming that effect — and how strong it will be — is tricky because a drop in infections in a given region might be explained by other factors, such as lockdowns and behaviour changes. Not only that, the virus can spread from asymptomatic carriers, which makes it hard to detect those infections.

“These are among the hardest types of studies to do,” says Marc Lipsitch, an infectious-disease epidemiologist at the Harvard T. H. Chan School of Public Health in Boston, Massachusetts. “All of us are out there, hungrily trying to see what we can get out of little bits of data that do come out,” he says. Results from some studies are expected in the next few weeks.

Stop infections?

Although most clinical trials of COVID-19 vaccines showed that vaccines prevented the disease, some trial results also offered clues that shots might prevent infection. A vaccine that is highly effective at preventing people from acquiring the infection in the first place would help to reduce transmission, says Larry Corey, a vaccinologist at the Fred Hutchinson Cancer Research Center in Seattle, Washington.

During the trial of Moderna's vaccine, produced in Boston, researchers swabbed all participants to see if they had any viral RNA. They saw a two-thirds drop in the number of asymptomatic infections among people who received the first shot of the two-dose vaccine, compared with those who received a placebo. But they tested people only twice, about a month apart, so might have missed infections.

The UK trial of the vaccine produced by the University of Oxford and AstraZeneca swabbed participants every week, and estimated a 49.3% reduction in asymptomatic infections among a subset of vaccinated participants compared with the unvaccinated group.

Pfizer, based in New York City and maker of another leading COVID-19 vaccine, says that it will start swabbing participants every two weeks in vaccine trials taking place in the United States and Argentina, to see whether the shot can prevent infection.

Less infectious?

It’s possible that vaccines won’t stop or significantly lessen the chances of infection. But jabs might make infected people less able to pass the virus on, or make them less infectious, and so reduce transmission.

Several research groups in Israel are measuring ‘viral load’ — the concentration of viral particles in vaccinated people who later test positive for SARS-CoV-2. Researchers have found that viral load is a good proxy for infectiousness[1].

In preliminary work, one team observed a significant drop in viral load in a small number of people infected with SARS-CoV-2 in the two to four weeks after receiving their first dose of the Pfizer vaccine, compared with those who caught the virus in the first two weeks after the injection[2]. "The data is certainly intriguing and suggestive that vaccination may reduce the infectiousness of COVID-19 cases, even if it does not prevent infection altogether," says Virginia Pitzer, an infectious-diseases modeller at Yale School of Public Health in New Haven, Connecticut. The Oxford–AstraZeneca trial also observed a larger reduction in viral load in a small group of vaccinated participants than in the unvaccinated group.

But whether these observed reductions in viral load are sufficient to make someone less infectious in real life is not yet clear, say researchers.

Gold standard

To really nail down whether vaccines prevent transmission, researchers are tracking the close contacts of vaccinated people to see whether they are being indirectly protected from infection.

As part of an ongoing study of hundreds of health-care workers in England, known as PANTHER, researchers at the University of Nottingham tested health-care workers and the people they lived with for SARS-CoV-2 antibodies and viral RNA between April and August last year, around the time of the first pandemic wave. They will now retest some of those workers after they receive the Pfizer vaccine, as well as their close contacts who won't have been vaccinated, to see whether the risk of infection has decreased for the close contacts, says Ana Valdes, a genetic epidemiologist at the University of Nottingham. If the risk decreases, that would mean the vaccines are probably preventing transmission, says Valdes.

Other groups, in Israel, are also planning to study households in which one member has been vaccinated. If these people become infected, researchers can see whether they pass on the virus to other household members.

In Brazil, a trial will randomly distribute doses of the COVID-19 vaccine produced by the Beijing-based drug company Sinovac to the town of Serrana in stages over several months. This approach could show whether drops in COVID-19 in vaccinated regions also contribute to reduced transmission in unvaccinated areas. This would demonstrate the indirect effects of vaccines, says Nicole Basta, an infectious-disease epidemiologist at McGill University in Montreal, Canada.

Studies of individuals and larger populations are needed to see how well vaccines protect against transmission, says Basta. “We really do need evidence that spans the whole spectrum.”

doi: https://doi.org/10.1038/d41586-021-00450-z

References

1. Marks, M. *et al. Lancet Infect. Dis.* https://doi.org/10.1016/S1473-3099(20)30985-3 (2021).

2. Levine-Tiefenbrun, M. et al. Preprint at medRxiv

Nature | ISSN 1476-4687 (online)