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Preliminary study suggests tuberculosis vaccine may be limiting COVID-19 deaths

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Luis Escobar, pictured, and two colleagues at the National Institutes of Health collected coronavirus mortality data from around the world. Photo courtesy of Luis Escobar for Virginia Tech. Credit: Virginia Tech

One of the emerging questions about the coronavirus that scientists are working to understand is why developing countries are showing markedly lower rates of mortality in COVID-19 cases than expected.

Research by Assistant Professor Luis Escobar of the College of Natural Resources and Environment and two colleagues at the National Institutes of Health suggests that Bacille Calmette-Guérin (BCG), a tuberculosis vaccine routinely given to children in countries with high rates of tuberculosis infection, might play a significant role in mitigating mortality rates from COVID-19. Their findings have been published in the *Proceedings of the National Academy of Sciences*.

"In our initial research, we found that countries with high rates of BCG vaccinations had lower rates of mortality," explained Escobar, a faculty member in the Department of Fish and Wildlife Conservation and an affiliate of the Global Change Center housed in the Fralin Life Sciences Institute. "But all countries are different: Guatemala has a younger population than, say, Italy, so we had to make adjustments to the data to accommodate those differences."

Escobar, working with NIH researchers Alvaro Molina-Cruz and Carolina Barillas-Mury, collected coronavirus mortality data from around the world. From that data, the team adjusted for variables, such as income, access to education and health services, population size and densities, and age distribution. Through all of the variables, a correlation held showing that countries with higher rates of BCG vaccinations had lower peak mortality rates from COVID-19.

One sample that stood out was Germany, which had different vaccine plans prior to the country's unification in 1990. While West Germany provided BCG vaccines to infants from 1961 to 1998, East Germany started their BCG vaccinations a decade earlier, but stopped in 1975. This means that older Germans—the population most at risk from COVID-19—in the country's eastern states would have more protection from the current pandemic than their peers in western German states. Recent data shows this to be the case: western German states have experienced mortality rates that are 2.9 times higher than those in

eastern Germany.

"The purpose of using the BCG vaccine to protect from severe COVID-19 would be to stimulate a broad, innate, rapid-response immunity," said Escobar, who noted that the BCG vaccines have already been shown to provide broad cross-protections for a number of viral respiratory illnesses in addition to tuberculosis.

Escobar stresses that the team's findings are preliminary, and that further research is needed to support their results and determine what the next steps should be for researchers. The World Health Organization noted that there is no current evidence that the BCG vaccine can protect people from COVID-19 infections, and stated that it does not currently recommend BCG vaccinations for the prevention of COVID-19. There are currently clinical trials underway to establish whether BCG vaccination in adults confers protection from severe COVID-19.

"We're not looking to advise policy with this paper," Escobar said. "This is, instead, a call for more research. We need to see if we can replicate this in experiments and, potentially, in clinical trials. We also need to come back to the data as we get more information, so we can reevaluate our understanding of the coronavirus pandemic."

Barillas-Mury, a chief researcher who specializes in mosquito-borne disease vectors, noted that establishing a link between BCG vaccines and COVID-19 case severity could result in attempts to stockpile doses of the BCG vaccine, placing countries with high tuberculosis rates at risk.

"If the BCG vaccine is protective, production would have to increase to meet the sudden spike in vaccine demand in order to prevent a delay in distribution to countries that very much need it to fight tuberculosis," she said.

While a direct correlation between BCG vaccinations and a reduction in coronavirus mortalities still needs to be understood more fully, researchers hold hope that the BCG vaccine might be able to provide at least short-term protections against severe COVID-19, particularly for front-line medical workers or high-risk patients. And, if BCG does provide short-term protection, there are longer term considerations about how countries could best utilize BCG vaccines to reduce mortality rates for future viral outbreaks that target the human respiratory system.

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