OPINION | THE WEEKEND INTERVIEW

Capitalism Is What Will Defeat Covid

The vaccine revolution didn't happen on its own. It's a product of decades of planning and investment.

By Allysia Finley
March 19, 2021 6:24 pm ET

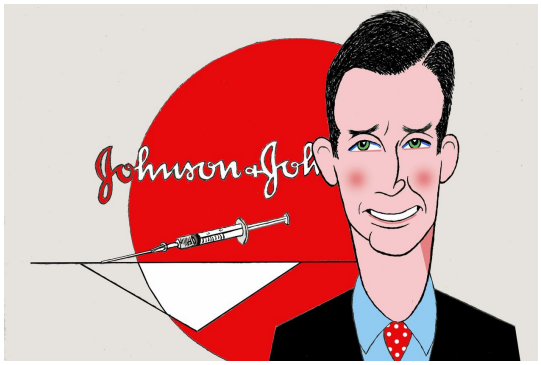

PHOTO: KEN FALLIN

Listen to this article
11 minutes

Behold the paradox of this pandemic moment: Large corporations are political villains, derided on the left and right. Yet the main, and perhaps only, reason the Covid-19 scourge is easing is vaccines developed by Big Pharma.

Few are more acutely aware of this paradox than Alex Gorsky, CEO of Johnson & Johnson, the healthcare device, pharmaceutical and consumer-goods company best known for products like Band-Aids and Tylenol. Politicians have vilified his industry over prescription-drug prices, and trial lawyers for using talc in its baby powder, which it discontinued in North America in 2020. But now J&J is a household name in the best way for developing its single-shot Covid vaccine, which the Food and Drug Administration approved for emergency use last month. The vaccine is increasing the U.S. supply of shots at a critical time and will enable a billion people world-wide to be vaccinated this year.

READ MORE WEEKEND INTERVIEWS

- How Israel Became the World Vaccine Leader March 12, 2021
- The American Dream Is Alive on Mars February 26, 2021
- How Equality Lost to 'Equity' February 12, 2021
- 'Majority Minority' America? Don't Bet on It February 5, 2021
- The 'Common Carrier' Solution to Social-Media Censorship January 15, 2021

J&J's road to the vaccine—from failure to life-saving success, from investment write-off to breakthrough—is a little-known story about science, business risk and innovation. There are also lessons for those who think capitalism is merely about rapacious profit.

"We would never be in the position where we are today if we had not invested billions of dollars over decades so that we could respond," Mr. Gorsky, 60, says in an interview the Monday morning after the FDA authorized its Covid vaccine. The U.S. Army veteran had been up since 3:30 a.m., getting in one of his early-

morning workouts before meetings. J&J's Covid-19 vaccine development over the last year has been a sprint, but the process that led to it has been a decades-long marathon.

Vaccines such as those for polio, MMR (measles, mumps and rubella) and seasonal flu have been made from weakened or inactivated viruses. But patients often produce a weak immune response to the inactivated viruses, and shots that use weakened viruses can make immunocompromised people sick. The manufacturing process is also laborious.

Scientists over the past couple of decades have been studying a potentially more efficient and effective method known as a "vector vaccine": using genetically engineered viruses to prime the immune system by delivering parts of a pathogen's genetic code into human cells. Our cell machinery then manufacturers the dopplegangers. The harmless look-alikes trigger an immune reaction, marshaling antibodies and white blood cells. When the real pathogen invades, the immune system is prepared.

"Your body has multiple layers of response in these situations. There's the immediate response, and there's the longer term response," Mr. Gorsky says. "Your body recognizes the virus and begins producing antibodies, as well as T-cell and B-cell response."

B-cells produce antibodies that act like sentinels and prevent infection. T-cells provide backup if a virus penetrates the antibodies' frontline defense and help enlist white blood cells into action. Antibodies can fade after a few months, but T-cells stick around longer and have something of a photographic memory. Some people who were infected with SARS in 2002-04 were found to have T-cells that remembered the virus a decade later.

J&J's vaccine was found to be 72% effective at preventing moderate to severe Covid symptoms (meaning two or more symptoms that don't require hospitalization) in U.S. trials. That's less than the 95% of the Moderna and Pfizer -BioNTech vaccines, which received emergency-use authorization earlier, and which are followed by a booster a few weeks after the initial shot. But the trials aren't directly comparable. For one thing, J&J's trial occurred later, in the fall and early winter, when more virus variants were circulating. Some variants with changes to their spike protein, which helps the virus infiltrate human cells, appear to partly elude the antibody response.

T-cells aren't as easily tricked. One reason scientists are excited about J&J's vaccine is that its one shot induces a robust T-cell response. This means immunity is likely to last longer—how long remains to be seen—and less likely to be defeated by new variants.

Mr. Gorsky attributes the strong multilayered immune response from J&J's vaccine to its innovative adenovirus-vector platform, AdVac, which it has developed over a decade.

Adenoviruses like those that can cause the common cold—so named because they were first isolated in human adenoids—are easy to manipulate because they have a large genome. They also don't integrate their genes into our own. This makes them an ideal tool for vector-vaccines. The problem is that many people have pre-existing antibodies to adenoviruses from prior infections, so their immune systems may try to shoot down the vaccine as if it were a cold.

In 2007 a promising Merck HIV vaccine, which used the adenovirus-5, or Ad5, failed to prevent infection in the later stages of a clinical trial. Worse, data indicated that people who tested positive for Ad5 antibodies were *more* susceptible to HIV infection than people who received a placebo, a phenomenon known as vaccine-induced enhancement. A 2008 article in the Journal of Experimental Medicine was titled "The failed HIV Merck

vaccine study: a step back or a launching point for future vaccine development?"

It was the latter. Merck's HIV-vaccine failure prodded more study of other adenoviruses like Ad26—the vector for J&J's Covid-19 vaccine. The Dutch biotech company Crucell had been experimenting with Ad26 in a vaccine to prevent malaria and other infectious diseases. Unlike with Ad5, antibodies to Ad26 didn't appear to sabotage the vaccine. In 2009, J&J entered into a partnership with Crucell to develop a vaccine it hoped could someday prevent infection from all influenza strains. Two years later, J&J bought Crucell for $2.4 billion.

"At that time we had little to no experience in vaccines," Mr. Gorsky says. But capitalism entails risk: Many Crucell vaccine studies failed, and "we ended up writing down a very significant portion of our initial investment." Still, Crucell brought along "two really important technologies that gave seed to what we're doing today."

One was the AdVac platform. The other was the PER.C6 manufacturing technology, capable of mass-producing vaccines quickly and cheaply. Despite earlier failures, J&J continued to work on vaccines for Ebola, HIV, Zika and respiratory syncytial virus, all of which are prevalent in developing countries.

The company has enrolled more than 150,000 patients in vaccine trials for these diseases, and last summer the European Medicines Agency approved its Ebola vaccine. Mr. Gorsky says the trials for other diseases have made the company confident that its vaccine platform is safe, even among people who have pre-existing immunity to its Ad26 vector.

Conducting trials in the developing world also gave the company's scientists confidence and knowledge to run global trials for its Covid vaccine. Most participants in J&J's Covid vaccine trial lived outside the U.S.—12.7% in South Africa, 17.3% in Brazil and 23.3% in five other Latin American countries. Trials in South Africa and Brazil showed that J&J's vaccine could prevent severe illness and deaths even against new variants.

"When we were debating clinical trial sites, and we asked could they logistically do this, some of our scientists had personally visited them and said, 'They can absolutely do this, and I can vouch and validate that they can,' " Mr. Gorsky says. "That's ultimately what put us in a position to be able to do such a high-quality trial at that particular moment, even in the face of those kinds of challenges."

J&J was a couple of months behind some other vaccine manufacturers, in part because its scientists had to make trade-offs to create a single-shot vaccine that could be mass-produced and rapidly distributed, including in developing countries. A single dose needed to produce a robust immune reaction, but not a reaction so strong that it caused severe side effects.

"We developed more than a dozen different permutations," Mr. Gorsky says, "and then we put them through some initial testing and selected our one candidate that we felt we could get the optimal balance." J&J's vaccine works by using its AdVac platform to transport the DNA that codes for the spike protein on the surface of the coronavirus into human cells.

J&J then worked closely with the FDA and the Biomedical Advanced Research and Development Authority, another federal agency, on clinical trials and distribution. Mr. Gorsky says that in his 30 years working in the pharmaceutical industry, he has never seen as much collaboration between drug makers and government, with which "we were sharing information in real time." Drug makers have also teamed up: "We all knew that,

while we competed in the marketplace, the real competition here is the coronavirus."

Merck recently agreed to produce J&J vaccines in its factories. In January Merck stopped development of its two Covid-19 vaccine candidates after early clinical trials showed weak immune responses. Merck's vaccines used different virus vectors than J&J's, but one had shown success against Ebola.

J&J's vaccine is the third to obtain FDA approval, but preliminary results from trials on AstraZeneca and Novavax suggest they are also highly effective. All these Covid-19 vaccines use innovative technologies that have been developed and tested over decades on other diseases. AstraZeneca's vaccine is similar to J&J's, but uses a chimpanzee adenovirus as a vector. The Pfizer-BioNTech and Moderna vaccines inject the virus's genetic code via mRNA, which instructs human cells to produce pseudo-spike proteins, which in turn prompts an immune response. Novavax's vaccine uses re-engineered spike-protein clones.

About 85% of vaccine candidates fail in trials, and those that succeed have historically taken 10 to 15 years to develop. It seems like an incredible stroke of luck and science that we have so many Covid-19 vaccines so soon. But it's more than that. Credit years of research and investment by drug makers, as well as government collaboration during the pandemic, which Mr. Gorsky hopes will outlast the pandemic.

"I think this is a golden moment, not only for Johnson & Johnson, but the biopharmaceutical industry," he says. "We fundamentally believe that having a market-based, innovation-based, biopharmaceutical as well as a medical-technology environment, is critical long term to produce the best overall outcomes for healthcare."

Ms. Finley is a member of the Journal's editorial board.

Appeared in the March 20, 2021, print edition.